

Electronic Payment Methodologies

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Abstract

This report analyzes market trends for electronic payment methods. It provides insights into how payment processes will change as a result of the Internet as part of INPUT's Electronic Commerce Program. Representatives of 50 corporate users, 10 payment processing services, 8 bankers and 3 financial regulators were interviewed to capture data and commentary about the potential opportunities available in this market.

Electronic Payment Methodologies identifies the payment methodologies that are most likely to become widely adopted. It also discusses trends, issues and future technology directions.

The report contains 124 pages and 53 exhibits.

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1997

Electronic Commerce Program

Electronic Payment Methodologies

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I

Introduction

A

Purpose

Payment systems are being revolutionized with the explosion of Internet commerce activity. Paper currency, electronic funds transfer (EFT), electronic data interchange (EDI), automatic teller machine (ATM) networks, and credit card processing are well-established payment vehicles that form a foundation for newer developments.

The pros and cons of payment systems from the perspective of payers, payees, and financial services providers are analyzed. The report describes the advantages and disadvantages of newer payment systems like digital cash, smart cards, and e-checks. It addresses questions such as:

- What technologies support emerging payment systems?
- What is needed for successful commercialization of payment systems?
- How can investment in global settlement systems be leveraged by newer payment systems?
- How do purchasing departments pay using credit and other cards today?

B

Scope

This report covers business-to-business, as well as consumer-to-business, payment methods. It reviews traditional and emerging payment methods, including smart cards, software-based payment, e-checks and credit cards. It is mainly U.S. research, however some European banks were interviewed.

The majority of the interviewees were in the U.S., though

The vendors covered primarily sell products, services vendors are not covered in detail.

C

Methodology

The report is based on in-depth interviews with 10 payment service providers, 3 financial regulators, 3 banks and 50 business users of payment methods. Telephone and e-mail were both used to conduct the surveys.

In addition, secondary research from vendor literature, online services and INPUT's extensive vendor files was used.

D

Report Organization

The report is divided into six chapters and three appendixes. The remaining chapters of this report include:

Chapter II, *Executive Overview*, offers an overview of the analysis conducted as part of the study and summarizes report findings. It provides a briefing for a senior executive who wants to understand the most important issues and conclusions without reviewing the entire study.

Chapter III, *Established Payment Methods*, examines current payment systems and analyzes their benefits, pitfalls and the current state of the art.

Chapter IV, *Emerging Payment Methods and Vendors*, examines emerging payment systems, both for the Internet and for storefront payments. It analyzes their processes, potential customers, security considerations, advantages, disadvantage and market acceptance. This is followed by an assessment of the method.

Chapter V, *User Awareness*, examines how users are reacting to new payment methods. Users' perception of benefits and barriers to acceptance for new payment methods analyzed. Existing payment system acceptance is also analyzed.

Chapter VI, *Issues*, discusses payment and legal issues.

Appendix A provides a glossary of key Internet terminology.

Appendix B contains the vendor names and addresses, standards committees and associations.

Appendix C contains copies of the questionnaires used in conducting the interviews.

E**Intended Audience**

int
Electronic Payment Methodologies is designed for:

- Storefront merchants and Internet merchants.
- Payment processors and financial institutions.
- Value-added network (VAN) and Internet service providers.
- Systems integrators, hardware manufacturers and software vendors selling into payment processing-related markets.
- Regulators and government organizations *that* who need to use or monitor payment processes.
- Internet technology vendors

It will help readers:

- Decide on which payment methodologies to invest in.
- Analyze competing payment processing service providers.
- Understand trends and market directions.
- Develop business plans and marketing presentations.

F**Related Reports**

INPUT offers Electronic Commerce and Internet subscription programs that track related commerce technologies and issues. The following INPUT reports are of related interest:

- *Electronic Catalogs, Web Storefronts and Internet Malls, 1995*
- *Electronic Commerce Over the Internet, 1996*
- *Internet Sales and Marketing Directions, 1995*
- *Using the Internet for Business Operations, 1995*
- *Internet Application Case Studies, 1995*
- *Internet Security: The Impact of Firewalls on Client/Server Applications, 1995*
- *Electronic Commerce Markets and Forecast, 1995-2000*

II

Executive Overview

A**Summary**

Several credit card and micropayment schemes are being proposed for the Internet. The current preferred payment method for Internet transactions is to use a credit card. Visa, Mastercard, American Express, VeriFone, Microsoft and others are working on SET standards for credit card processing over the Internet and these are likely to be widely accepted. *(Secure Electronic Transactions)*

Mondex, initiated by National Westminster Bank in the UK, is gaining global acceptance by banks and is a strong contender for a micropayment cash card scheme, both for storefront and network transactions. CyberCash, currently with a proprietary scheme, will follow SET standards and is likely to be a major technology supplier and payment systems vendor. Smaller companies like DigiCash may have to find niche markets, lest they be overtaken by Mondex and credit card vendors' cash card schemes. Visa and Mastercard will not allow the electronic cash systems vendors to encroach on their markets and will also be major players.

Digital signature schemes are starting to be accepted. Signatures stored in both wallets and on computers, slowly gathering momentum, will become common at the beginning of the next century. There will be tremendous opportunities for manufacturers of POS (point-of-sale) and payment processing systems to upgrade merchants, banks and payment service companies. Security will become tighter as systems evolve and excellent opportunities in supporting, building and testing security systems will develop.

B**Key Trends and Issues**

Exhibit II-1 lists key trends and issues regarding electronic payments. Security challenges will increase as fraud and hacker activity grow. Digital



signatures and encryption schemes will make Internet payment schemes safer than traditional checks that can be stolen, counterfeited or signed with forged signatures. Money laundering may be a long term issue.

Exhibit II-1

Trends, Issues, and Opportunities

Trend	Issues	Opportunities
Security	• SET acceptance for credit card Internet transactions • Digital signatures will be gradually accepted - Certificate Authorities will be a new type of organization • Fraud will increase, although many Internet schemes are safer than current payment schemes	• Payment processors and banks can offer Internet services • Services and products based around security • Digital signature verification and authentication services • Fraud detection systems
Smart Cards	• Cost of merchant equipment • Consumer acceptance • Competition from debit cards, particularly in the U.S. • Card introduction in a new area - how to run pilot systems • For business to business trade, POs and checks are still preferred, although Purchasing Cards are increasingly used	• POS system upgrades • Global vendor systems to support worldwide purchasing - purchase here, deliver there • Internet credit card processing turnkey systems • Smart card "on the street" and "on the net" systems Smart cards are likely to be used for small amounts
Robust Messaging	• More intelligent messages that include digital signatures • More reliable message routing • Multimedia messaging	• Services that rely on signed documents • Directory and routing services • Higher speed private networks • New businesses that sell small items and accept digital cash will become popular

Exhibit II-1
(Continued)

Trends, Issues and Opportunities (Cont.)

Trend	Issues	Opportunities
Internet Shopping	- Will Internet malls succeed and who will run them - banks, Internet service providers, telecommunications companies or financial payment processors? - What payment methods will be preferred- a global digital currency could impact national economies	- Payment reporting and data aggregation will differentiate merchant services - Merchant services to support Internet shopping - Interfacing existing credit and debit card processing systems to the Internet - Check truncation systems, particularly scanning devices to capture check information
Outsourcing data management	- New level of detail possible with Internet payments - Merchant services will increasingly be outsourced	- Customer analysis and reporting software - Long term outsourcing contracts - New applications that can be outsourced, for example transaction payment services using products like Open Market's OM-Transact

Source: INPUT

C

Which Payment Systems Will Win?

1. Outlook

Credit cards clearly have an early lead for payment over the Internet, but for smaller transactions or anonymous purchases they are unsuitable.

Businesses continue to prefer checks to any other form of payment, although the use of Purchasing Cards is growing.

The Internet will fuel further growth of Purchasing Cards. Debit cards will increasingly be popular, but may have limited use overseas.

Cash cards are more widely used in Europe and Japan than in the U.S.. Vendors like Mondex that can combine Internet payment methods with those for storefronts are at an advantage over those that support either the Internet or storefronts.

Both checks and cash will see declining use over the next 10 years. However, neither is in danger of disappearing. Singapore, for example, aims for a cashless society, but for most countries this will be impractical.



Exhibit II-2 lists the traditional payment systems reviewed in this report and summarizes their outlook.

Exhibit II-2

Outlook for Traditional Payment Systems

Payment System	Outlook
Cash	- Will decline in use, particularly small denomination coins - Debit and credit cards will be the main alternatives - If cash declines significantly, central banks will be at risk of losing interest and therefore will want to be involved in issuing digital currencies long term - this will counteract technology providers' tendency to develop global currencies
Checks	- Check truncation with image scanning at point of capture will take advantage of existing systems - Paper checks will always be used for some transactions, but a decline in their use can be expected towards the end of the 20th century
EFT or ACH Transfers	CheckFree, the Quicken Financial Network and other services that enable consumers and businesses to pay checks electronically will compete with Internet payment schemes
ATM Machines	- More global connections via Cirrus, Plus, Link and other networks - Mainly used by consumers, more intelligent ATMs that provide other services, like smart card replenishment, are being designed - May be adapted to supply other goods - airline tickets, stamps
Credit, Debit and Cash Cards	- Mondex is a promising smart card scheme for both storefront and Internet purchases - Visa Cash and similar credit-card company schemes will be likely to be successful
Trade Credit	Will continue, because practices to support it are widely implemented

Source: INPUT

Exhibit II-3 lists the major emerging payment systems reviewed in this report and summarizes their outlook.

Exhibit II-3

Outlook for Emerging Payment Systems

Payment System	Outlook
CyberCash Cards and Coin	- CyberCash will move to SET standards as they evolve and is likely to be a major payment systems vendor. - Its coin scheme is subject to considerable competition and its future is less clear.
DigiCash ECash	- ECash is likely to be a niche product that is used by small businesses that cannot obtain credit card processing, although over time they are expected to have agreements with service bureaus and banks to undertake their payment processing. - It lacks the support of big business to be a serious threat to national currencies.
FSTC E-Check	- After a somewhat shaky start, the pilot was demonstrated in Sept. 96. A full pilot trial is expected by early 1997. - Skepticism surrounds E-check because it automates the paper process and seems cumbersome to credit card processors who have overcome many of the problems that the FSTC is trying to solve. - This is likely to merge with other schemes for digital payment as they are adopted and clear winners emerge.
First Virtual	- First Virtual has an innovative system that enables merchants to accept credit card payment even when they may not qualify to accept credit card payments. - This system supports largely small businesses. - First Virtual keeps its credit card numbers off the net for security, but this makes the processing more labor intensive than some of the other schemes. - As standards emerge, First Virtual may need to become a payment processor for other schemes as it is unlikely that its processes will survive in the face of competition from Mondex, Visa and others.
Mondex and Visa Cash Cards	Mondex is a promising smart card scheme, initiated by National Westminster Bank in the UK, for both storefront and Internet purchases. Mondex has global partners and a strong awareness of the entire payment processing environment, including government regulations, that a smaller vendor cannot match.
SET Credit Card Processing	Widespread vendor support and popularity of credit card payment for Internet transactions make this a promising approach. For all except the smallest items it is likely to be the primary means of purchasing goods on the Internet.
SSL Netscape	- This is a simple standard for securing a web server, not a complete payment methodology. - It has been a quick fix for web merchants, but is likely to be integrated into more sophisticated systems that use SET.

Source: INPUT

2. Five Year Outlook

a) 1996 - Year of Internet Prototype Commerce

- SSL-enabled Commerce Web Servers for simple credit card encryption
- CyberCash and SET implementations start to be available
- Web use is mainly for promotion, with some order taking

b) 1997 - Commerce Pilots Move To Significant Systems

- Web ordering takes off, many more commerce-enabled web servers
- Digital signatures start to be used and become a status symbol
- Wide availability of SET systems, software and services
- Internet wallet standard emerges
- New regulations for e-check and stored value cards
- E-check and check truncation FSTC projects continue
- Micropayment cards see success in new market niches
- Network computers for the Internet provide more low cost access, widening the potential market for goods sold over the Internet
- Explosion of Web Catalogs, especially for industrial products
- Digital certificates foster exchange of bills, invoices, POs over the Internet
- Internet backbone gets upgraded to layered network offering different classes of service for different service fees, IPv6 increasing number of addressable nodes

c) 1998/9 - Year of The Smart Card

- Micropayment schemes shake out, difficult times for vendors like CyberCash and DigiCash if they fail to adopt standards
- Visa, Mastercard, Europay roll-out microprocessor card "wallets"
- Signed e-checks complement the exchange of POs over the Internet, but acceptance rate is slow, given competition from Visa and others
- Internet bill presentment deployed

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d) 2000/1 - Market Maturity Begins

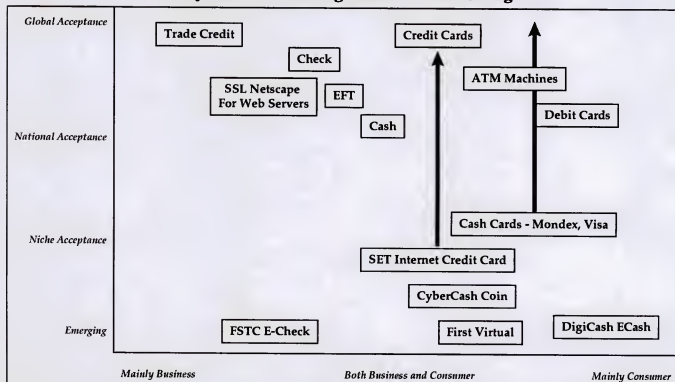
- Banks provide Internet business services
- Business accounting software incorporates modules for paying and billing over the Internet
- Value of goods and services traded over the Internet reaches \$165B in 2000 and \$600B in 2001

3. Payment Methodology Positioning

Exhibit II-4 positions payment processing methods regarding acceptance and major users. Trade credit is the established method for business-to-business transactions, whether via purchase order (PO), bartering or letter-of-credit. Credit cards are accepted in most countries of the world, although the U.S. has more extensive use of them. Until recently when Purchasing Cards were issued they were primarily used by consumers and for Travel and Entertainment (T&E) in business. Increasingly they will be used by businesses for purchasing small items and for web transactions. The SET Internet payment scheme endorsed by Visa, Mastercard, Microsoft, VeriFone and others will be globally endorsed as it rolls out in products and services starting this year.

Exhibit II-4

Payment Processing Method Positioning



Source: INPUT



D**Conclusions**

- Digital currencies are still in their infancy and no clear digital cash winner has yet emerged.
- Credit cards and the SET standards offer promise as an Internet payment method that is likely to succeed rapidly.
- Merchants are sensitive to costs. If a scheme has high costs, like credit card processing then it must offer additional benefits like superior reporting.
- Fast processing gives a methodology a competitive advantage, but bear in mind that merchants may want some time to pay bills. One way to address this is to waive transaction charges for certain classes of electronic transactions to encourage faster payment, just as POs offer advantageous terms for early payment.
- Excellent customer relationships will increasingly differentiate payment processors and service providers.
- Networking and Internet technology is sometimes hard to implement reliably. Systems must be set up that make it easy for customers to link to other systems.
- Use of widely accepted standards, such as SET, are essentials for any transaction processor.
- Transaction processing can be differentiated by bundling marketing data with an aggregate transaction report. Service providers need to understand how they can expand data capture and data aggregation processes to offer added value.

E**Recommendations****1. Recommendations for Merchants**

- Watch emerging smart card standards carefully, don't go it alone, ensure that other merchants in your market or region are using the same technology.
- Invest in multi-purpose equipment.
- Offer your goods and services on the web.

*do search & replace for web -
Replace w/ Web X*

- Consider using a service provider, bank or payment processor to handle Internet web commerce functions.

2. Recommendations for Non-storefront Businesses

- Evaluate where Purchasing Cards can best be used.
- Consider using the Internet for purchasing, if this is not already used.
- Offer employees guidelines for paying for goods and services purchased from web servers.
- Consider the level of data aggregation and marketing information required when choosing new payment schemes.

3. Recommendations for Banks

- Consider offering a pilot Smart Card project in an entire town to establish merchant relationships.
- Offer web merchant services and support, either directly or via third parties, to merchants with which you have credit card or banking relationships.
- Explore check processing and consider how back-end systems can be made to handle Internet payment systems, retrofitting old systems may not be the easiest migration, it may be easier to consider alternative processes.
- Team up with recognized Certificate Authorities and promote the use of digital signatures for other businesses, such as loans.
- Offer services that help merchants and businesses pay consumers electronically.

4. Recommendations for Payment Product and Services Vendors

- Offer Internet services to existing customers, or risk losing their entire payment processing business to a competitor who can provide Internet services.
- Consider how financial check paying networks will interface with Internet payment systems.



III

Established Payment Methods

This chapter discusses how traditional payment systems, i.e. cash, checks, electronic funds transfers, automatic teller machines, credit/debit/cash cards, and trade credit will fare as newer payment methodologies are introduced.

A

Current Payment Methods

In the U.S., about 20 billion payment transactions annually are by check, 15 billion transactions by credit card, and 8 billion transactions by ATM machine. The type of payment method used varies according to the type of transaction:

- Consumer-business
- Business-consumer
- Business-business
- Consumer-consumer

Exhibit III-1 shows the major payment methods used by

- Retailers
- Large consumer billers (such as utilities and telephone companies)
- Businesses to pay other businesses

Exhibit III-1

Current Use Of Payment Methods

Payment Method	Retailers	Large Consumer Billers Consumer to Business	Business to Business
Cash	20	80	
Checks	50	10	
Credit Card	26	5	1
Debit Card	4	5	
PO, Trade Check, Credit			90 (may incl. check)
EFT			5
Other			4

Source: INPUT

Businesses like checks. Retailers accept a wide range of payments, and consumers preferring to pay in cash. Checks and credit cards compete for both hard goods and soft goods purchases at department stores, superstores and boutiques. Credit cards dominate Mail Order Telephone Order (MOTO) retailers. ATM cards are popular in supermarkets, convenience stores and gas stations. Credit card networks issue debit cards which look like a credit card to a merchant, and look like an ATM card to a consumer, except they don't have a PIN. Retailers already handle 30% of their transactions using either debit or credit card, a relatively high percentage of electronic processing compared with other business segments.

Big billers like mortgage companies, utilities, phone companies, insurance companies and credit card issuing banks use lockbox services to process payments from consumers, usually by check or by a draft issued through a service like CheckFree. Increasingly direct payments are made, but storefront sites to accept bills are still common for consumers that want to pay in person. Returned checks are forcing some of these billers to accept credit card payment, despite 2-5% processing fees. Only about 10% of these consumer-to-business payments are electronic.

Business-to-business trade is still firmly tied to POs. EDI has been a failure if judged by the number of businesses that accept it, about 40,000 in the U.S. Slow payments and check are the norm for business-to-business payments and companies like to use the float. Purchasing card programs are rapidly being accepted and their use is likely to increase in this segment as purchase

orders are replaced by electronic transactions, such as ordering from an industrial catalog over the Internet and paying by credit card.

B

Cash

1. Background

Cash is widely used and a national phenomenon, with each country having its own currency. The holder of cash has to keep their own transaction records. Software products like Quicken help keep track of transactions, but generally business deals with cash by setting aside a petty cash box for small purchases. In the commercial arena, cash registers and POS terminals capture cash transactions for merchants. Some banks refuse to handle small cash deposits unless the currency is packaged in rolls, as the processing cost is too high.

2. Benefits

The main benefits of cash are that:

- It is universally accepted.
- It represents a real store of value.
- Transactions can be made anonymously in a retail outlet.
- The origin of stolen cash cannot easily be traced.

3. Pitfalls

Cash has many problems associated with it, which is why alternatives like checks and credit cards are so popular:

- By holding cash and not investing it, there is a cost to the holder at least equal to the minimum interest rate.
- Cash tends to be heavy and not easily transportable — it is not practical to send it by mail.
- Risk of theft, errors in records or loss is high:
 - slippage (thefts or errors) may be as high as 4%.
- Supporting cash processing is expensive for a merchant:
 - Armored vehicles may be required to transport it.

- Someone or a machine has to count it.
- Small change is inconvenient and expensive to handle.
- Point-of-sale equipment has increased in cost as it becomes more automated.
- Taxpayers are penalized by the cost of minting, processing and destroying currency.

4. State-of-the-art

Singapore aims to replace cash transactions in the next ten years. Countries continually replace low denomination coins with those of higher value. They replace coins with paper as inflation makes their metal content worth more than their trading value.

It is unlikely that cash will disappear in retailing and in consumer-to-consumer transactions, as many merchants will remain relatively unautomated. However, vendors building a new business on processing cash would be advised to look elsewhere for growth opportunities as cash use is likely to decline.

C

Checks

1. Background

Checks represent funds available in the payor's bank account. They are forms that promise to pay at a later date. For many centuries they were used by the elite and only in the 1920s did they start to be widely accepted. After WWII, check popularity thrived in North America, but for paying utility bills and regular items GIRO and direct payment became more popular in Europe. The latter two methods having the aim of keeping paper out of the clearing system.

2. Benefits

Checks are widely used because:

- Users find them easy to fill out
- They can be mailed
- They reduce the likelihood of theft
- They provide proof of payment, particularly in the U.S. where the IRS and others like checks as record of payments made



- They frequently can be processed outside the country of origin, albeit for a fee
- Virtually anyone can cash them, given enough time for funds to be released

3. Pitfalls

Checks are:

- Expensive to process
- Subject to fraud — check fraud is on the increase and counterfeit measures offer new opportunities for systems suppliers
- Non-uniform in size — whereas consumer checks are standardized, business checks come in many sizes causing problems for sorting machines

Bank statements showing check payments and receipts are woefully inadequate compared with credit card statements. It is rare for a bank to list the payee on a statement; usually the check number will suffice to record a transaction.

Checks persist in being difficult paper items to process because:

- Regulations and custom make signed documents a necessity for some transactions
- Banking laws have impeded innovation
- A large investment in people and processes has already been made in check processing; it is hard to make major process redesigns when corporate empires are at stake

4. State-of-the-art

About 29% of U.S. payment transactions are by check. About 60 billion checks are written annually in the U.S., and according to industry sources, about 20 million are written by businesses. The average cost to process a check is at least 50 cents (George Kaufman, *U.S. Financial System*, Prentice-Hall 1991).

A tremendous industry has grown up around check processing, with federal regulations in the United States governing the time a bank has to process a check. The Federal Reserve Bank clears about 40% of the U.S.'s checks and charters planes, helicopters, trucks and couriers to meet its nightly deadlines. Sorting, filing and returning checks has led to tremendous

opportunities for systems vendors, primarily IBM, Unisys and NCR. Niche vendors, like BancTec, have also emerged.

Increasingly, banks truncate checks, that is they do not send them back to the customer. This means that they do not have to handle paper throughout the system and can rely on microfilm or images if the payer needs a check copy at a later date.

There are two aspects to printing checks with a laser printer; one is printing the check with magnetic toner to fill in the account information; the other is to fill in the payee, amount, and date, which should not use magnetic toner. Magnetic toner may confuse check sorting systems, laser-printed account numbers at the bottom of the check (in the MICR line) may wear off before they have completed their passage through the check processing system. However, encoding the amount on the bottom line of a check can save a proofing step in a bank's check processing operations, where operators with character recognition machines automatically enter or type in the amount so that it can be read by a machine in subsequent sorting operations. Checks may be sorted over 10 times, but the average is somewhere between 5 and 7 sorts per check.

CheckFree, a service that enables customers to pay bills electronically from software such as Intuit's Quicken, are not really check free. In some cases, CheckFree makes an electronic payment, more commonly it prints its own paper unsigned drafts and passes them through the system, exposing CheckFree to more risk than that normally assumed by banks. However, it does save the user having to put stamps on envelopes and handle paper.

INPUT's research found that many businesses, particularly large ones pay their bills and receive payments automatically, creating their own virtual checking system. They may send their accounts payable file to a bank, where the bank takes over bill paying. For incoming checks, many businesses use bank or payment processing services. The bank can then transmit data on magnetic tape or over a network that can be put into the Accounts Receivable system.

D

EFT or ACH Transfers

1. Background

Electronic funds transfer (EFT) payments are transfers of data to move funds from one place to another, instead of paper. Financial EDI (FEDI) is the final process in ordering goods using EDI that pays the bill electronically. Automated Clearing Houses (ACHs) form an electronic funds transfer network that conforms to NACHA (National ACH Association) standards. The ACH is used for direct deposit into a bank account of wages, salaries and



social security. It is used to pay mortgages, utility bills, membership fees, subscriptions and for many other transactions including FEDI.

In 1995, the ACH Network processed nearly 3.5 billion items, growing at about 14% annually for the last 4 years, with a total value of more than \$11 trillion. Currently an estimated 90% percent of all ACH transactions are consumer transactions. In 1992, ACH transactions were 4% of the number of checks and 12% of the value in the U.S. (Source: J. K. Dietrich, Financial Services and Financial Institutions).

2. Benefits

By value as many as half of all corporate payments are already made by some electronic process, such as EFT, FEDI or Purchasing Card. Much of this is payroll processing which for most corporations is the biggest cost. This study found that only about 5% of transactions are made electronically.

The main benefits of EFT are:

- Paperless processing inside the system, saving processing time and costs
- Widely accepted standards for certain applications, payroll processing, benefits transfer, medical claims processing, regular bill payments

ACH networks work directly with bank accounts, thereby enabling connections to many different types of customers, consumers, large business, small business.

3. Pitfalls

- Interfaces directly into ACH networks are not readily available for small businesses, unless they use a financial processing service. It is therefore more suitable for repeated transactions than for one-off payments.
- It is up to the user to keep detailed reports on transactions.

4. State of the art

EFT is a less costly process than transferring a paper check between banks, or even a check image. ACH networks are increasingly being used as the back-end to many different payment systems. For example, FSTC's e-check demonstration used ACH processing at the final step.

Services like CheckFree will increasingly use ACH networks, instead of creating paper drafts as digital certificates become more widely accepted.

ACH networks are in a strong position to process digital cash as they interface directly to bank accounts. *because*

E

Consumer ATM Machines Transfers

1. Background

Automatic Teller Machines (ATMs), as their name suggests, are designed to reduce the costs associated with having bank tellers. About 70% of ATM visits are for cash withdrawal. Consumers use ATM cards on average 10.6 times per month and 85% of checking account users have use ATM machines at least monthly. *once per*

Consumers use ATM cards at POS systems less than 3 times a month. They prefer to use ATM cards for essential items, like food, so as to avoid going into debt. *rather than credit cards*

Automatic teller
ATM machines are interlinked by different networks such as Cirrus, Plus, and Link (UK). They are moving from their traditional banking locations into supermarkets, business complexes and entertainment complexes.

2. Benefits

- ATM machines are now widely located, with international connections available in many countries.
- Merchants typically pay lower transaction fees on debit cards than on credit cards.

3. Pitfalls

Some of the disadvantages of ATMs:

- Fees for some transactions discourage use. *include*
- Limits on amount that can be obtained from a machine. *there is*
- Consumer has to find a machine; money cannot be printed in one's house. *must* *obtained from*

4. State-of-the-art

Automatic teller
ATM machines have the potential to dispense not just cash, but information, stamps, tickets and coupons. In Swindon (U.K.), for Mondex's cash card trial, the ATM machines were used to fill up reloadable cards. *Automatic teller*
ATM machines may also dispense cash cards.

F

Credit, Debit and Cash Cards

Need to clarify meaning

1. Background

Credit cards have traditionally been used for travel and entertainment in business. Diner's Club had the first general travel and entertainment card, with a high membership fee and a 6% fee for merchants. BankAmericard was the biggest card issuer in the 1960s and evolved into an industry association to mutually accept cards from other banks that became Visa. Visa now operates one of the largest ATM networks and is a major network services provider. According to the Federal Reserve, 80% of households have credit cards and 66% use them regularly. Credit card processors, like First Data and NaBanco, handle 70% of credit card processing, with banks holding the remaining 30%.

VeriFone (Redwood City, CA) has shipped over 5 million transaction verification terminals in 100 countries and had 1985 revenues of \$387M. It recently announced a venture with Microsoft to take its credit card validation software, vPOS, thus advancing Internet commerce. VeriFone is the leader in equipment for capturing credit card information.

Credit card limits were often too small for major corporate purchases, the transaction fees inappropriate and handling multiple users of a card was hard. Visa and Mastercard recognize the limitations of credit cards when it comes to business use. Following American Express's successful program for corporate credit cards, they have jumped into this market. Purchasing Cards are designed for corporations. According to Visa in 1996, Visa, Mastercard, American Express and Discover cards paid for \$737B of goods and services in the U.S. and \$1485B worldwide. Purchasing Card holders can obtain monthly statements electronically on disk or tape. Reports can contain three levels of information, depending on the data captured by the POS system:

- Level 1 — date, merchant, location, total
- Level 2 — as above plus item detail and sales tax
- Level 3 — as above plus user specific codes for special projects, item groups.

INPUT believes that approximately half of the consumers with credit cards would like this type of reporting. With software such as Quicken, consumers are increasingly analyzing their expenditures more closely.

Debit cards have been issued by Visa and Mastercard member banks to appeal to the merchant who wants lower fees and the consumer who does not want to exceed his credit limit. Debit card payments are settled at the end of

the day, when cash is taken from the owner's bank to pay off transactions. With a secured credit card the consumer maintains a cash balance to cover the payments in another account, useful for consumers with poor credit ratings who may otherwise not get a card. Neither debit cards, nor secured credit cards are personal identification number (PIN) protected.

Visa Cash cards were introduced at the 1996 Atlanta Olympic games to pay for small cash items. They store local currency, for example in the U.S. \$10 amounts. Cards may be for one-time use or they may be reloadable at an ATM. Visa reports that in 1994, consumers worldwide spent approximately \$8.1 trillion in cash purchases. Twenty-two percent of that amount, or \$1.8 trillion, represents purchases of \$10 or less, hence the attraction of cards that can handle small amounts without the need for post-payment processing. Consumers are attracted to cash cards for their convenience, merchants are attracted because they do not have the transaction processing validation and post-payment processing ^{requirements} associated with credit cards.

2. Benefits

Consumers see the benefits of credit cards as:

- Less cumbersome than checks.
- Providing detailed statements listing place, time and amount of each purchase.
- Delaying payment, ^{and} improving cash flow, at no cost if the bill is paid on time.
- A credit line, if needed.
- Limiting losses to a \$50 maximum if a lost or stolen card is reported within 48 hours.
- Allowing disputed or erroneous card charges to be left unpaid if identified within 30 days

Merchants view credit cards as a way to expand their market and assure the payer has funds. By verifying the card transaction, merchants are ^{that} ~~saved~~ ^{spared} the inconvenience of chasing bad debts.

Issuers see the benefits of credit cards as:

- Providing extensive databases, which in the U.S. may be used for targeted marketing
- Generating lucrative interest payments, higher than normally offered by a bank loan

3. Pitfalls

Even as recently as 1995, merchants selling on the Internet could not qualify for the most expensive Mail Order/Telephone Order (MOTO) fee scale. This was the impetus behind First Virtual obtaining credit card merchant accounts on behalf of resellers. The credit card companies now have defined SET standards to support credit card processing over the Internet.

Users are concerned that credit card issuers have access to intimate purchase details, particularly in Europe, where in some countries it is illegal to use credit card purchase information for marketing.

4. State-of-the-art

Purchasing cards are typically used for MRO (maintenance, repair and office) services and products. The added value is that the card processor can produce timely and accurate reporting to the corporate card holder.

Credit card transactions now account for 15% of consumer purchases. Over 50% of users do not use their credit lines and pay their card balances on time.

G

Trade Credit

1. Background

Trade credit used to be common before the advent of credit cards in the 1960s, with lay-away plans and hire purchase agreements. Department stores, gasoline companies and grocery stores issued their own cards. All but the largest merchants, who need to capture data on their customers, have seen their own cards fall into disuse. In some areas, trade credit is still used, not only by retailers, but also by doctors, dentists and tradespeople.

Business-to-business commerce still relies on trade credit. For example, "2/10, net 30 days" gives a discount of 2% if the invoice is paid in 10 days, otherwise it must be paid in 30 days. Purchase orders and invoices are still the norm in business transactions, extending credit until the bill is due.

2. Benefits

Slow payments are a way companies can improve their balance sheets temporarily; any new mechanism that affects cash flow adversely may meet with resistance as businesses

Service providers generally support users well with appropriate software, systems support and interfaces to other payment systems



IV

Emerging Payment Methods and Vendors

This ^{chapter} section considers a few of the leading contenders for new payment methods. The advantages and disadvantages of each ^{each method is} method are described, and are followed by an analysis of their likelihood of market acceptance.

A

Why Are New Payment Methods Needed?

More than 50 new payment methods are being proposed for electronic payment. Some are academic pilots, others commercial implementations. The perceived benefits are:

- To make transactions move faster; for example, smart cards make supermarket queues move faster.
- ^{To provide alternative payment mechanisms for the Internet} Credit cards have high processing fees if the card is not shown or the transaction value is small, hence ^{alternative payment mechanisms are} alternative payment mechanisms are needed for the Internet.
- To gather more information about customers.
- To aggregate data for subsequent analysis.

1. 1. Data Capture

Given the success with which major credit card issuers like AT&T and Citibank have been able to analyze their customers' buying habits, there is tremendous interest on the vendors of payment methods to capture marketing information.

^{captured by} If a payment method captures valuable information about a purchaser this may be used for:

Can't get rid of extra 1.

- Allocation of marketing resources.
- Changing buying behavior.
- Forecasting market changes.

2. Data Aggregation

Companies like Nielsen and Oracle, with its Express software, analyze aggregate data so that customer groups, product lines and market segments can be analyzed from payment systems.

B

Cybercash, Cards and Coins

1. Process

CyberCash (Reston, VA) was founded in 1994 by VeriFone founder Bill Melton and InterOp trade show founder Dan Lynch. In many ways its processes mimic those used for credit cards.

In 1995 CyberCash issued the CyberCash Wallet, that initially supports credit card transactions. RSA 768-bit encryption, exportable with up to 1024-bit keys by special license that CyberCash obtained from the U.S. government, is used to encrypt key exchanges. The data sent from the wallet is encrypted using 56-bit DES encryption.

Credit Card Processing For Internet Purchases

The main steps in the payment transaction process when using CyberCash technology are:

1. Buyer shops by browsing web servers and choosing goods. Client sends message to server listing goods it wants to purchase. Server sends message summarizing transaction to the buyer. Buyer clicks on "Pay" button which launches a CyberCash, CheckFree, CompuServe or AOL wallet and chooses from the wallet a credit card.
2. Client clicks OK to forward the order and encrypted payment information to the server.
3. Merchant responsible for server, separates order and forwards payment information to CyberCash server using digital signature and private key encryption. The merchant never sees the credit card information.
4. CyberCash server takes the credit card information behind its firewall and off the Internet. It unwraps the data using crypto box hardware

(as used by banks between ATM networks), reformats the transaction and forwards it to the merchant's bank over dedicated lines.

5. The merchant's bank verifies the transaction with the credit card company for approval or denial. The resulting code is sent to CyberCash.
6. Based on the code, CyberCash passes the code to the merchant who then passes it to the consumer.

CyberCash claims the entire validation process takes about 15-20 seconds, similar to getting credit card validation in a store.

A diagram illustrating this process, plus additional explanation is available on the Web at <http://www.cybercash.com/cybercash/info/sixsteps.html>.

CyberCash Coin Processing

CyberCash is expected to have introduced a micropayment electronic or based payment scheme for purchases as low as 25 cents by the end of 1997. A consumer will be able to fill their CyberCash wallet with electronic coins from their checking account.

To fill the wallet the consumer asks CyberCash to get an amount, say \$100. The next day this is sent into the wallet having been cleared via ACH.

The coin is data and not a store of value. CyberCash will track each transaction, as it did not see the market demand for privacy.

In addition, the wallet keeps a log of transactions on the user's local computer. CyberCash offers data capture and aggregation both on the buyer's computer and its own.

If the wallet is lost or damaged on the buyer's computer, CyberCash will have a transaction record that can be used to restore it. CyberCash is, potentially, for electronic coins, in the position that American Express is in for Travelers' Checks, that is, that they can be replaced worldwide.

This scheme is not private like Chaumian ECash described elsewhere in this report.

2. Typical Merchant

CyberCash supports a number of diverse industries. CyberCash has attracted high quality firms like Novell, Oracle and Farallon in the software industry.



It has agreements with trade associations, food companies, ^{and} sports clothes vendors.

J. D. Power and Associates, a consumer market research company, and Virtual Vineyards, wine merchants, support CyberCash wallets.

By June 1996, 1,004 merchants had signed with CyberCash for credit card processing, ^{of which} 128 live ones that accept wallets, up from 315 (with 74 live) ^{on} at March 31, 1996. ^{were}

Merchants who wish to support CyberCash must first sign with a bank or credit card processor as a Credit Card Merchant and be assigned Merchant and Terminal ID numbers.

The bank will supply these to CyberCash on request. The merchants install the CashRegister Secure Merchant Payment System (SMPS) modules that can be downloaded from the CyberCash web site.

3. Advantages

CyberCash wallet technology is gaining acceptance from companies like CheckFree and AOL.

The wallet provides a convenient place to keep track of digital signatures, credit cards, e-check and ECash.

By storing personal details in a browser or wallet, the consumer will not repeatedly be asked for name, address, credit card info at each web site visited. This should make Internet shopping more attractive.

Exportable long keys, means ^{that} globally standard software can be developed for wallets. Also, the technology

Connects to over 80% of banks in the U.S.

Additional benefits are:
Tolerable processing times of 20 seconds for the buyer, and the fact that the

Merchant does not see ^{the} buyer's credit card number, thus increasing security.

The payment processor can work with CyberCash's servers with minimal investment because it follows credit card processing standards.

4. Disadvantages

Merchants ^{must} need to register with a bank or credit card processor, which for small merchants may be a disadvantage.



new in
must also have
Merchants need CyberCash software to be installed.
There is a
Per transaction fee payable to CyberCash by payment processors.

5. Security

CyberCash offers enhancements over SSL security.

It solves the problems of false charges by merchants and denial of charges by consumers (non repudiation).

It authenticates digital signatures, protecting both buyer and seller.

It offers banks protection against security flaws at merchants who may have a hacker attack or dishonest staff that steal credit card numbers. The merchant never sees the numbers and does not maintain a credit card file.

The SET standard offers comparable security.

6. Market Acceptance

CyberCash's initial credit card service was introduced in April 1995.

Electronic coin services will be available late 1996 and the e-check services are expected in 1997.

CyberCash went public in February 1996, and revenues for the first half of 1996 were \$38 million.

Transaction processors that have approved CyberCash's gateway for their banks and merchants include:

- Global Payment Systems (MAPP/NDC)
- Visa (Vital)
- American Express
- Wells Fargo Bank
- CheckFree
- First Data Corporation (Envoy, CES, NaBANCO, FDR)
- NOVA

Wells Fargo, both a bank and a processor, has been signing up CyberCash Internet merchants since the beginning of 1996.



Most banks rely on non-bank service companies to process credit cards.

Non-banks control 70% of the transaction processing market, led by First Data.

SET standards will mean that CyberCash can support any compatible merchant software.

CyberCash supports leading UNIX and Windows NT operating systems.

its development partners include:

- Digital Equipment
- FTP Software
- InterCon
- Netcom
- Open Market
- Quarterdeck
- Sun Microsystems

"Assessment"
indicates some
kind of evaluation
or opinion, not
just a statement
of fact or descrip-
tion of the scheme.

CyberCash has made its wallet available not only to service providers, but also to banks for private labeling. It is likely to be bundled with browsers.

In 1996, CyberCash expects to add Internet checks. The coin and check schemes will expand CyberCash's support for lower-end merchants, smaller transaction amounts and users that do not qualify for credit cards.

7. INPUT Assessment

CyberCash has an experienced management team with broad reaching contacts and alliances. The company is a pioneer that can switch its product line easily to accommodate new standards and software. Its processes are proven as they resemble those for traditional credit card processing.

evaluation CyberCash is an emerging player and with its back-end processing software for merchants has considerable opportunities for growth.

statement Physically the original CyberCash credit card acceptance system is similar to SET in that it binds the merchant to the buyer's actual credit card number.

CyberCash has been involved with SET design and is modifying its products and processes to support SET.



CyberCash supports Internet credit card transactions.

VeriFone's vGate will enable merchants to bypass CyberCash and connect to payment processors directly.

CyberCash has established solid brand name identity with web software and system vendors.

Sun, Digital and SCO embed CyberCash's payment modules into their web solutions.

VeriFone may be stronger than CyberCash in the Windows NT market, because of a development agreement with Microsoft.

In the UNIX market, CyberCash has the lead.

CyberCash's lack of "on the street" solutions, where VeriFone is strongest, may prove to be its greatest weakness.

CyberCash's plan to derive revenues from payment processors on a per-transaction basis may be lucrative short term. Long term it remains to be seen whether competition will enable it to continue to charge for its secure gateways.

INPUT believes that in late 1996, and early 1997 the CyberCash Coin scheme will be gradually adopted. If it proves "safe" then it will spread.

Merchants still think "credit card" when considering how to be paid over the Internet, hence CyberCash has a major education and promotion effort to evangelize the use of its coins.

The main competitor to CyberCash Coin is smart cards, where some banks believe the physical ownership of a card by a buyer makes the system more reliable and secure.

Much depends on the payment technology used and in the success of network computers.

If these Internet appliances adopt smart card technology, then CyberCash Coin is less likely to succeed long term. If, however, users find Smart Cards cumbersome and prefer digital solutions to be stored in their computer, CyberCash may be the long-term micropayment leader.

A payment scheme that works both on and off the net will be the long-term leader.

Microsoft intends to put a digital wallet in its Internet Explorer browser before the end of 1996 and by 1997 it will be embedded in Windows.

The wallet is intended to secure a user's personal information, certificates, passwords and even numbers like social security numbers.

This should help standardize what otherwise would be a plethora of wallets, some of which can be downloaded from DigiCash, VeriFone, CyberCash, V-One and others' websites.

C

DigiCash/ECash

1. Process

DigiCash was formed by cryptographer David Chaum in 1990, head of the University of Amsterdam cryptography department. Research funding has been obtained from the Dutch government and the European Community.

DigiCash's Chaumian ECash system evolved from stored value cards for paying highway toll fees. It has been trialed since 1994.

CyberBucks, *pretend money*, was issued to users who downloaded a software wallet. CyberBucks paid for software, clip art and other *soft goods* that would normally be free. Over 30,000 people signed up for the trial. A year later, the Mark Twain Bank of St. Louis, MO issued ECash coins in real U.S. dollars as a trial.

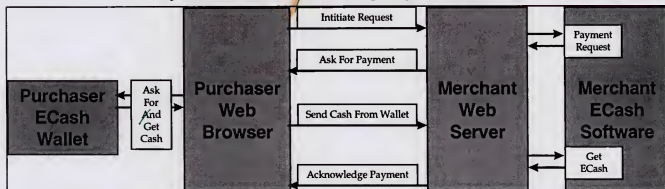
The Swedish Post Office offers ECash coins in Swedish Kroners (crowns). EUNet, a Finnish bank, also offers ECash in Finnish Marks.

ECash provides buyer anonymity once it has been purchased and its source cannot be traced.

The seller does not have anonymity for once *ECash* it is received it *must* needs to be deposited in a bank.

Hence, Chaum refers to his technology as having "constrained anonymity". The buyer can prove who the seller is by reference to serial numbers. Consequently, ECash may be good for purchasers of drugs, but it is not good for paying kidnap ransoms! Exhibit IV-1 provides the workflow diagram for ECash processing between a purchaser and a server.

Exhibit IV-1

Payment Process For Using DigiCash ECash

Source: INPUT

ECash works as follows when there is no firewall:

- Purchaser's web browser sends a request to merchant's web server to purchase goods
- Merchant's web server asks merchant ECash software if it can request payment, merchant ECash software sends message via web server back to purchaser's web browser
- Purchaser's web browser passes request for ECash to purchaser's ECash wallet and gets cash
- ECash is sent back to merchant and added to store of ECash in merchant's software
- Merchant ECash software acknowledges receipt of cash and transaction confirmation is sent back to purchaser

The merchant then has to settle with the bank to exchange the ECash for real currency. The method has to be modified to work with a firewall. It does not work well with proxy servers at present.

In the case of Mark Twain Bank, a customer has to maintain a conventional account there to hold real currency that can be used to pay for ECash. Set-up costs are \$11 to \$25 for a purchaser and \$150 to \$500 for a merchant.

2. Advantages

Anonymity for the purchaser.

Merchant does not need credit card account.



There is No per transaction fee; however, the merchant pays 2-3% to convert ECash into real currency; consumers pay between nothing and \$3 to convert real currency from a checking account into ECash; consumers moving ECash into the checking account pay 4-5% of the amount. *X*

Merchant fees include technical support and free links to the site from DigiCash's home page.

3. Disadvantages

Leading edge merchants tend to use credit cards. Not many merchants are using DigiCash's ECash at this time and many that are *doing* are offering niche goods, e.g. UNIX software for Windows '95. *stet*

There is Little bank support for ECash, Mark Twain bank in the U.S., EUNet in Finland. *stet*

ECash Does not work well with firewalls that use proxy servers. *stet*

It Can only be used for a single transaction, unlike conventional notes and cash. Each transaction must be validated with the issuing bank to make sure the cash has not been spent before.

There is No automatic data capture, a user must set this up for himself. *stet*

When a disk crashes, ECash cannot be recovered. *stet*

4. Security

To avoid spending ECash more than once it is tagged with a number that is checked. *X*

When a merchant is offered ECash for payment of goods its validity is tested against the issuing bank's database.

ECash processes may also be used on a card, giving *more* additional security than that provided by keeping the keys off a computer. *2*

As a software *only* solution, the safety level is high for buyers, sellers and the issuing bank. *There exists an issue as to who deposits ECash first, the legitimate seller or fraudulent impostor.* *What?*

Sellers would be wise to deposit the ECash *first* before shipping goods.

If the seller does not ship the goods, the buyer can prove he sent the ECash and pursue the seller.

5. Market Acceptance

DigiCash estimates that 30,000 people were involved in its trials with pretend currency and market acceptance was reasonably positive.

However, when it comes to real payments though the banking industry is not behind DigiCash.

This means merchants have few places to redeem their ECash for real currency.

6. INPUT Assessment

The widely held perception that ECash is good for drug money laundering and illegal activities is likely to be false, because of the lack of protection for anonymity of the receiver of payment.

DigiCash has produced a strong research effort, that illustrates flaws in current Internet payment processes.

ECash may be used for certain low volume purchases, but more widely accepted standards are likely to prevail. DigiCash may be better sticking with niche markets, as it has done successfully with toll road cards than trying to be a general purpose Internet payment solution.

Competition from Visa, Mastercard and Mondex is likely to be severe long term. They are better funded, have major vendor support and have global connections.

D

Financial Services Technology Consortium e-check

1. Process

Financial Services Technology Consortium (FSTC), formed in September 1993, is a consortium of some 65 organizations comprising banks, financial services firms, industry partners, national laboratories, universities, and government agencies.

FSTC's Electronic Check (e-check) is an online payment instrument that is settled nightly.

It is a method to improve the clearing process in today's largely paper-based check processing system.

Banks are afraid that consumers may desert checking accounts, in favor of money market and other accounts. This means the asset base from which loans are made may shrink.



In an attempt to encourage the use of bank checking, e-checks have been designed for both "on the street" and "on the net".

Initial pilots use a PCMCIA PC card that can be inserted into a standard PC card reader.

The card, not the PC, holds the user's personal information. PCMCIA was chosen because it is a widely accepted standard and supports more data storage than a typically Smart Card.

PCMCIA cards typically cost \$20, more than 6 times as much as Smart Cards.

At a POS terminal a PCMCIA card reader processes the card, this is more expensive equipment than widely installed magnetic stripe card readers.

However, notebook and personal organizer use of the cards is expected to make prices fall.

The e-check standards will not preclude the use of Smart Cards for widely deployed systems. Indeed, e-checks are designed so that they can be sent over many different hardware architectures and networks. A workflow diagram for FSTC's e-check processing can be seen at their web site: www.fstc.org.

The FSTC views e-check processing in a similar fashion to paper check processing. They would batch transactions and deliver a group of checks to a bank as they do today.

Fees may be on a per deposit basis to discourage merchants from making many small deposits.

The recipient of a check can verify the digital signature, as paper check signatures are verified today.

Optionally a funds verification service like Telecheck may be contacted. It is likely that many recipients will skip check verification and charge fees for returned items due to insufficient funds, illegal signatures or other reasons for check rejection.

E-checks will dovetail with electronic bill presentment (ebp) that large organizations like utilities are starting to consider.

A consumer could receive an e-bill, complete with electronic coupons, literature or advertisements. This could be returned to for payment with an e-coupon to which the e-check could be attached.

Graphical logos, icons and art, similar to that found on web pages, could make e-bills attractive.

For business, common user interfaces could be designed for electronic bill paying and existing EDI systems to simplify user training.

For EDI transaction payment, the e-check may be sent over an existing VANs.

As in paper check clearing, the bank of first deposit (BOFD) will endorse the e-check. It will optionally verify the signature and transmit the e-check for presentment to the issuing bank.

As in paper check processing, there may be intermediaries like the Federal Reserve, third-party payment processors or ACHs. The FTSC hopes the e-check may foster new inter-bank payment networks, such as BIPS (formerly EPH) another FTSC project.

(BIPS) would provide netting and clearing between two BIPS capable banks and also interface to ACH clearing and settlement systems.

E-checks are attractive to check processors ^{because} they significantly reduce payment processing costs, ^{not} as paper handling costs are high.

Within the banking system, laws will have to be changed to accept a digital signature of the payee and permit electronic presentment to the issuing bank.

Just as Regulation CC governs the time a check can be in the clearing system, regulations will need to be passed for e-checks to ensure banks don't hold on to the float for too long.

2. Typical Customer

^{Although paper} Paying by check is common in business. ^{Some of these} Some of these transactions will be undertaken with Purchasing Cards, ^{and} but some could move to e-check.

Citibank and Bank of Boston are driving the effort.

^{A potential} Another customer ^{type} could be the user who wants to carry around an electronic wallet instead of a check book.

3. Security

E-checks are securely encrypted and carried mainly on private banking networks. Public and private keys are kept on a card or in software.

Signing, verification, and hashing functions are kept in a protected processing area in a PCMCIA implementation, not on the host computer. This may be more secure as it is not open to attacks on the host.

If someone loses a card, then it could lead to fraudulent use if the correct ID information was also available to the thief.

4. Advantages

The e-check enables banks to use their existing infrastructure for check processing to support Internet and other electronic payments. The digital signature offers more security than a physical signature on a paper check.

E-check workflow follows existing paper check processes to enable acceptance by banks and payment processors.

E-check design enables great flexibility, through support for other types of payment instruments, e.g., certified check, cashiers check, credit card charge slip, etc., and added capabilities, such as future dating, limit checks, and multi-currency payments. It is unfortunate the PCMCIA cards have been the first encoding of the e-check for a customer. Embedding it in Quicken would have given it a better chance of early success.

No need to use an EDI service provider, the Internet is sufficient.

Both large and small users can use e-checks, enabling corporations to reimburse employees and consumers to buy from large and small merchants.

Can also be sent from consumer to consumer. Receiving e-checks enables significant electronic credit. This can be an advantage to the payee, who now has funds without going to a physical bank.

The e-check can be integrated into other payments systems, such as micropayment billing systems.

The payee can authenticate the payer using digital signatures with a higher level of security than is possible with today's checks. Digital signatures can be validated automatically, more easily than comparing paper check signatures, using either the human eye or signature verification systems. E-checks are expected to cut down on check fraud.

Data capture on deposits will be easily performed by banks, once their e-check systems are installed, offering banks the opportunity to provide (possibly for a fee) more meaningful deposit logs and bank statements to their customers.

Once systems have been installed the costs of processing e-checks should be a fraction of the cost of processing paper checks.

5. Disadvantages

Significant investment in bank systems and tracking e-checks will require new software and it is not clear that banks are prepared to make the investment, given check truncation, image scanning capture of paper checks and the popularity of paper checks.

Packaging e-checks so that they are easier for the consumer to handle than paper checks will be a major effort. Given the rise in debit cards, it is not clear that consumers will need to carry another e-check card.

Merchants are unlikely to integrate PCMCIA card readers with their POS systems just for e-checks. Adding them to handle many tasks is possible, but e-checks may not be the driving application. Visa and Mastercard see merchant upgrading to Smart Card readers in the 1997-1998 timeframe, but upgrading to PCMCIA card readers is less likely. In addition, at least a few financial services groups are pushing different check image capture at the POS schemes on large retailers, which they feel unable to support. If e-checks cannot be accepted at the POS it seems unlikely they will gain support elsewhere.

E-checks are late to market, debit cards and other electronic credit card schemes are ahead of them.

6. Market Acceptance

Growth of checks is lower than that for credit card payments. However, a healthy 5% annual growth in check processing for the last five years means that the e-check market has potential. This would indicate a long term revolution of the check processing environment, not a short term solution. It is unlikely that e-checks will be widespread before the turn of the century if at all.

The major US banks, including Bank of America, Bank of Boston, Bank of Montreal, Bank One, Chemical Bank, Citibank, and Wells Fargo Bank are involved in FSTC projects.

Industry participants include BBN, Equifax Check Services, IBM, National Semiconductor, Sun and Telequip.

Advisors include Bellcore, Oak Ridge National Laboratory, Sandia National Laboratory, NACHA and others.

Telequip supplies its Crypta Plus memory card and token technology in an e-check board version.

National Semiconductor has been offering the project a PCMCIA solution.



7. INPUT Assessment

E-checks are an electronic version of a paper check. Usually, automating a paper process is not an efficient way to move from a paper environment to an electronic one. E-check processes for the purchaser are yet another process using digital signatures, and INPUT's research does not indicate high interest.

From the check processor's perspective, e-checks are less threatening to existing organizations and power structures built around check processing than credit card or entirely new processes.

Currently paper check processing is accompanied by electronic records that can be adapted and modified to support e-checks.

Check truncation is seen as an alternative to e-check processing, with users still having paper checks rather than electronic check books. Debit cards are the most serious competition to e-checks, as both processes remove cash from a purchaser's checking account directly.

CheckFree, although it relies on unsigned drafts and ACH networks for bill paying, will substitute for e-checks as interfaces to its service are provided in more accounting packages. Quicken Financial Network, enabling consumers to pay from AOL or Quicken, that supports banks directly will also compete with e-checks.

E

First Virtual - Off-the-Internet Security

1. Process

First Virtual Holdings was founded in 1994 by a team that included Nathaniel Borenstein, who invented the widely used MIME e-mail protocol while at Bellcore, and Marshall Rose who has written highly regarded books on Internet technology. Other members of the management team were from Hollywood and the entertainment industry, providing a virtual company connected via networks.

First Virtual relies on "out of band" security that is the credit card number is not connected to the Internet. It is kept on a separate server at First Virtual and sent to them by phone or fax. First Virtual acts as a trusted third party between buyer and seller.

A first time shopper has to register an account with First Virtual.



Initial communication is by e-mail and a potential account holder is reminded regularly to hand over their credit card number via phone to First Virtual before a transaction is made.

Once the holder has an account ^{he is issued} they get a VirtualPIN and First Virtual handles the credit card authorization.

Each time a customer makes a purchase an e-mail is sent to First Virtual that is then confirmed by e-mail and telephone.

The buyer responds to an e-mail from First Virtual asking if they want to buy with "Yes", "No", or "Fraud" ^{he} the latter meaning the product is not wanted. In the case of a "Fraud" ^{he} reply the account number will be blacklisted and a new VirtualPIN assigned.

Accounts are settled with merchants using ACH ^{orders} to credit the merchant's checking account. First Virtual keeps transaction logs and information.

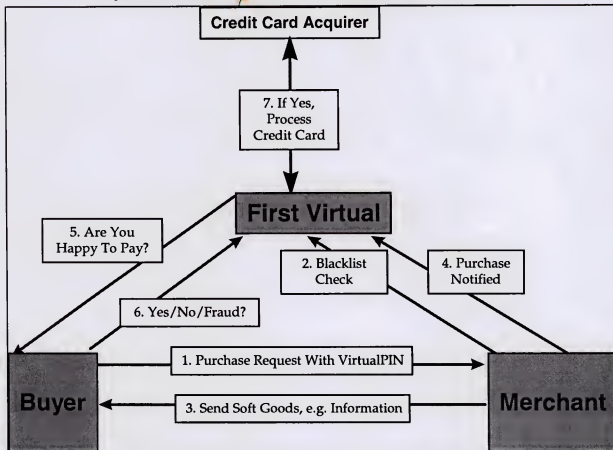
For fulfillment of soft goods, the VirtualPIN is sent to the merchant, who will verify that it has not been blacklisted by First Virtual and will send electronic goods to the purchaser. Exhibit IV-2 shows the workflow diagram for how the payment transaction is carried out for delivery of soft goods that can be sent over the Internet, such as information.

what does
"No" mean,
then?



Exhibit IV-2

Payment Process For Soft Goods Using First Virtual



Source: INPUT

2. Typical Merchant

The typical merchant is a small organization that does not qualify for a credit card number. These include gift vendors, publishers and software sellers.

3. Advantages

The first virtual system is
Simple for the buyer to understand. *Buyer only needs credit card and e-mail account.*

First Virtual provides a software toolkit to support merchants *who* have their own servers.



Merchants without servers can rent space on First Virtual's InfoHaus mall (\$1.50 per megabyte per month).

First Virtual provides a service to small merchants who cannot qualify for credit card accounts, or for whom ^{such accounts} they are prohibitively expensive.

4. Disadvantages

First Virtual does not credit the merchant until a certain balance is reached, whereas a credit card acquiring bank usually settles the account the day after credit card slips are deposited. For some merchants, First Virtual can hold payment for as long as 90 days.

Buyers may repeatedly type "No," abusing the system. First Virtual monitors such cases and removes accounts that abuse the system.

Users cannot complete ^{SKD VM} transaction in one sitting, they need to send an e-mail and possibly telephone First Virtual. The buying process is slow and unsuitable for impulse purchases.

For the purchase of physical goods, the buyer can repudiate the purchase, denying ^{that} the goods were ever ordered and causing the merchant a fraudulent loss.

Telephone Order (TO) Companies typically ask the buyer for additional information, such as a billing address ^{over the phone} and then they get verification that the goods were received by ^{requesting that} getting carriers like FedEx and UPS to obtain signatures from the recipient.

5. Security

Keeping credit card numbers off the Internet makes the system as secure as for a typical Telephone Order (TO) merchant.

6. Market Acceptance

By March 1996, First Virtual had signed up 109,000 consumers and 1,370 merchants in 144 countries.

In early 1996, First Virtual was estimated to be moving ⁵⁰⁰ \$60K worth of trade per day and signing up about 4000 customers a week. It charges customers \$2 (waived until mid-1997) and sellers \$10 to register.

The merchant also pays 29 cents plus 2% of the sale amount on each transaction. Each time a payment is made to their account, sellers pay a \$1 processing fee.



Fraud rates are currently low, but so they were when credit cards first started. The charge-back ratio so far is about 0.02%.

7. INPUT Assessment

Pre-paid digital cash and cash card schemes will become the norm for paying for small items.

First Virtual is doing a service for the small merchant, but it is not likely that users will suffer the inconvenient user interface for long.

Merchants depend on the solvency of First Virtual for their payments, which may be slower in coming to them than if they were using a bank.

When banks and credit card processors widely support smaller merchants, First Virtual's system will not be attractive to them.

The technologists at First Virtual are ^{skilled} strong, they will either think of ^{solutions} other things to do or leave and create another company.

First Virtual is likely to follow industry standards and ^{become} change into a different type of company or be dwarfed by SET systems supported by the major banks, Microsoft, VeriFone, RSA, Visa, Mastercard and others.

F

Micropayment Systems, including Visa

1. Process

Micro, nano, and pico payment systems all deal with paying in small amounts on the Internet.

Fare cards, pre-paid subway tokens and pre-paid phone cards are example of stored value ^{cards} instruments.

Users trust the card provider to honor the value as ^{cards} they are not issued by a government, and if the card is not used for its intended purpose its value is wasted.

In micropayment systems, the user pays in advance, simplifying downstream processing and reducing transaction costs.

A U.S. positioning of different proposals is given in Exhibit IV-3. In Europe and elsewhere privacy laws may make banks unable to use purchasing information.



3. Pitfalls

Processing a purchase order, invoice and shipping receipt is estimated to cost from \$20 to \$80. Tight financial controls and integrated accounting systems provide high quality reports, but at significant cost.

EDI is not widely accepted.

Standards for different paper forms abound; in addition there are U.S. standards and international EDIFACT standards.

EDI formats are data processing oriented, with fields that *correspond to* paper documents such as purchase orders.

On the web it is not clear that this kind of interface is useful. Users may prefer to enter full text comments, send their digital certificate with personal details and order by checking boxes next to a catalog entry. The price can be kept at the merchant and *sent the* quantity of an item and item identification number sent across a network. The merchant can display the price to the user on a web form and look it up in their database when ordered.

4. State-of-the-art

EDI is used by about 40,000 companies in the U.S., a small proportion of the total number of firms. It is best for regular transactions, rather than casual purchases. Web purchasing is more likely to be used for "one-off" purchases.

Primary commerce, where goods are used in the production of a company's products, is where EDI is most likely to be used, rather than in secondary commerce that supports the administration of the business.

H

Outsourcing Data Capture and Data Aggregation

INPUT research indicates that many large organizations have already outsourced some portion of their data capture or data aggregation associated with payment processes to financial system outsourcers or trading partners. Examples of processes that are outsourced are:

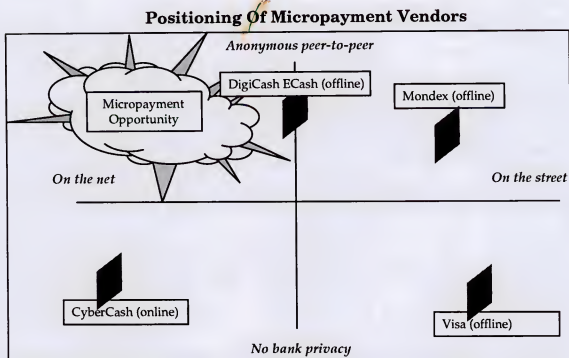
- credit card processing
- FEDI (financial EDI) and EDI
- lockbox
- payroll
- billing



Interested readers should contact INPUT about its Outsourcing Program for further information in this area.



Exhibit IV-3



Checking accounts preserve value and are insured up to \$100,000 in the U.S. Stored value systems for the Internet typically store up to \$500. Disposable smart cards usually come in small denominations up to \$20.

Reloadable cards can be filled from a bank, using a credit card or other means. No system permits a user to carry tens of thousands of dollars in a smart card or notebook computer.

In Europe and Japan, high telephone charges motivated the move to smart cards to reduce credit card verification costs.

2. Security

Software-only micropayments systems like DigiCash ECash and CyberCash Coin use keys stored on a PC.

When a user enters a PIN, a virus may enter the computer and steal it. PCs are vulnerable to attack. *the PIN*

Banks feel happier with security information stored in a card that can be stored in a purse like a key and kept safe.

Hardware wallets also offer some protection, *because* given they are worn on or carried close to the user.



3. Market Acceptance

Global cash transactions amount to \$8.1 trillion a year, of which 22% (\$1.8 trillion) is for amounts less than \$10. In the U.S., estimates of consumer cash transactions are around 300 billion (Source: Bank for International Settlement), and 225 billion are under \$20 (Source: American's Community Banker, May 1995).

it is estimated that In the U.S., 56% of transactions *are* estimated to be made in cash. Worldwide cash accounts for 90% of all transactions. An estimated 60 billion bank-facilitated consumer transactions, *1/5* one-fifth the number of cash transactions, use credit card, debit card, ATM card, checks and wire transfers. Automating cash handling is the incentive to use smart cards (cash cards). It is likely that there will be gradual acceptance of smart cards, but it is unlikely that half of all cash transactions will use smart cards by the year 2000, as some industry estimates would indicate.

Visa has trials of Visa Cash in Australia and it had a trial system at the 1996 Olympic Games in Atlanta.

First Union and Wachovia *(banks)* were two of the first to offer Visa Cash cards, which come in disposable or replenishable versions. Many more are expected to follow.

Disposable Visa Cash cards can be purchased by anyone, *1/m* a banking relationship is not needed. In Atlanta, they were available in denominations of up to \$100.

Visa's Electronic Purse consortium includes an international group of banks, including:

- Bansys, Belgium
- EPS (Electronic Payment Services), Delaware
- FISC (Financial Information Systems Center), Taiwan
- CD Groupement des Cartes Bancaires, France
- Sociedad Espanola de Medios de Pago, *(Spain)*

Austria, Portugal, and Denmark have their own cash card schemes. MAC ATM network was proposing a unified ACH card, but prospective banks are turning to Visa and Mastercard.



Mini-micropayment schemes, Designed for *fraction of a cent transactions* are proposed by Digital (Millicent), W3C (Micropayment Transfer Protocol) and Payword/Micromint from Ron Rivest of MIT.

These are being proposed for metered applications, where payments may be in fractional amounts. Whether users need to buy small items like nails for a fraction of a cent remains to be seen.

4. INPUT Assessment

Micropayment schemes are viable and many alternatives will be available. These will vary by vendor; certain industries may prefer certain schemes, depending on who vendors target.

Mondex, Cybercash Coin and DigiCash E-Cash are discussed in this chapter in their own sections. Visa, Mastercard and Mondex are likely to be leaders.

G

Mondex - Cash Card

1. Process

Mondex was invented at the UK's National Westminster Bank in 1990. In July 1996 it was spun off and is now owned by 17 organizations:

- NatWest and Midland Bank PLC (UK)
- The Hongkong and Shanghai Banking Corporation Limited (Hong Kong and 12 further Asia/Pacific territories)
- Canadian Imperial Bank of Commerce and Royal Bank of Canada (Canada)
- Australia and New Zealand Banking Group Limited, Commonwealth Bank of Australia, National Australia Bank Limited and Westpac Banking Corporation (Australia); ANZ Banking Group (New Zealand) Limited, Bank of New Zealand, Countrywide Banking Corporation Limited, the National Bank of New Zealand Limited, ASB Bank Limited and Westpac Banking Corporation (New Zealand)
- Wells Fargo Bank and AT&T Universal Card Services (USA)

Mondex wallets have been developed by such manufacturers as Hitachi. They are calculator-like and a Mondex card may be inserted in the wallet or carried separately.

How is the "17" determined?
(more than 17 entities listed)

The advantage of the wallet is that it may be used to store additional value beyond ~~that~~ ^{what is} on the card. Mondex cards may also be read by PC peripherals or POS terminals.

Cash may be sent from Mondex card to Mondex card over a network, such as the Internet. Hence Mondex provides a system that is both "on the street" and "on the net". The Mondex system can be used at adapted ATM machines, special phones, PCs and POS terminals with appropriate card readers. Since it is shared electronic information, it can be relayed over the special phones.

Exhibit IV-4 shows how soft goods can be ordered using a Mondex card. The card is inserted in a card reader in the user's PC on request from the merchant. Each card is validated.

The process is similar to that of DigiCash, but more tracking takes place in the card.

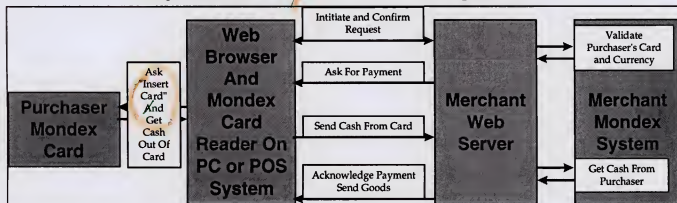
In the San Francisco trials, the last ten payments ^{were} recorded and then cyclically written over. So if a card was found, a bank could trace its last 10 transactions.

Transactions are not completely anonymous.

There are no monthly statements.

Exhibit IV-4

Payment Process For Soft Goods Using Mondex



Source: INPUT

A consumer needs a bank account with a sponsoring bank. At a minimum, a consumer needs a Mondex card, but may also rent or buy an electronic wallet, PC card reader and balance reader.

Manufacturers of Mondex-compatible equipment include Hitachi, Verifone, Unisys, Amdahl and Keycorp.



Value can be transferred to retailers and also to other individuals that support the system. Transaction detail can be viewed with a wallet or with a balance reader that looks like a key chain.

A merchant would normally transfer the contents of the till by phone to a bank. Only the cash sum is sent to the bank; POS details are kept in the merchant's cash register.

For a robber to get cash from a Mondex till, he would need the PIN number of each card that had put cash into the till.

The till records each card number to or from which cash is transferred and the amount. This makes it possible to get refunds. The refund is linked to the card that put cash in the till.

Bringing a merchant a receipt for returned goods will be insufficient to get electronic cash. The card that made the purchase will be needed.

2. Typical Users

Any vendor that accepts credit cards, either in a store or over a network is likely to be a candidate for Mondex.

3. Advantages

The merchant has tremendous incentive to use Mondex as it facilitates cash management. Banks also see Mondex as reducing cash handling costs.

Consumers can use Mondex with many different devices.

4. Disadvantages

In the Swindon (U.K.) trials, 10,000 purchasers signed up, well below the 40,000 expected. Cost of the service was one reason consumers balked.

Devices like ATMs, POS card readers and telephones are starting to be made that support Mondex devices. Conversion will not be overnight and will cost a lot to both users and merchants. Banks will offer rental programs to smooth the transition to new equipment.

Whereas the architecture of the Mondex system is designed for all transaction values, it is being promoted as a system for storing under 500 pounds sterling (\$750) at a consumer's site initially to prevent large losses or major errors.



5. Security

Wells Fargo Bank chose Mondex because it was more secure than storing electronic cash on a PC and the processing was well thought out. Banks will be reluctant to send electronic cash to a PC without a separate store of value, like a Mondex card.

Mondex plans to change the software in its cards every two years at least to keep up with hackers and others that may seek to break security codes and protocols. The digital signatures on merchant and consumer cards are changed frequently.

When a consumer withdraws cash for a Mondex card from a bank account or a merchant makes a deposit of Mondex electronic cash, digital signatures may be changed. Each chip (initially a Hitachi microprocessor) in a Mondex card has two different security systems on board: one active, one dormant.

Periodically, cards are instructed to activate the dormant system. This then becomes the active system over time and a new dormant system can be added, this enables upgrades to be made without changing the physical card.

When data is sent between cards, the cards are known to the protocol, so that a hacker with a different card from the intended recipient will not be able to intercept the transaction.

Privacy International, a consumers' right to privacy group, has filed a complaint against Mondex for falsely advertising that it is just like cash. They claim that since the merchant has a list of purchasers that the bank may use to track payees, this makes it less private than cash.

6. Market Acceptance

The main pilot program has been in Swindon (U.K.) where over 70% of the town's 1000 merchants could accept the card. In addition, BT was recruited to equip 200 payphones with the ability to read Mondex cards and taxicab drivers were able to accept them.

More than 10,000 cardholders signed up for below the desired 40,000 participants. Special screen phones to refill the cards and act like in-home cash machines were deployed at some consumer and merchant sites.

In addition, bank ATM machines were modified to take Mondex cards. Wells Fargo Bank in San Francisco has been trialing the Mondex system in the city's financial district. Further trials are planned in Hong Kong and Canada.



The key to a successful trial is getting a critical mass of merchants to accept the cards.

Mondex is expected to coexist with credit card company cash schemes. VeriFone's new SC line of card readers works with Visa, Mastercard and Mondex cards.

Mondex expects that some cash will always be used, particularly for the gray market and for paying people unable to afford Mondex cards, such as low income households and beggars.

7. INPUT Assessment

Mondex is well-poised to be a winning micropayment system, especially across national boundaries, because of its international support. Currently Mondex cards can store up to 5 currencies at one time.

Mondex trials have been well received by merchants who save time in counting change and settling with the bank. They can phone in their receipts instead of physically transporting them to the bank.

Mondex does not provide a full audit trail, and government bodies and several major banks have felt that this would be necessary. MasterCard plans to provide audit trails for larger amounts (as dictated by government offices in each country).

Mondex has good multicurrency and multiple account capabilities. The latter can be used for credit, debit and other purposes, supporting a multifunctional card concept.

Mondex is well aware of the regulatory issues surrounding electronic cash and has made presentations before the U.S. congress.

Visa Cash is expected to be a major competitor.

Mondex is not fully compliant with the standards developed by Visa, MasterCard and Europay (EMV), but MasterCard has specified that, as a term of its acquisition of 51% of Mondex.

Most banks are much more interested in SET technology that can be used with credit cards on the Internet for on-line payment transactions rather than Mondex or other electronic purse concepts.

May not be a complete sentence.

Should be, "has specified that it do so, as a term..."?



H

Netscape and Others - Credit Cards Using SSL**1. Process**

Netscape's SSL (Secure Sockets Layer) uses CCITT X.509 signed certificates. Netscape uses VeriSign as its certificate authority.

Merchants are widely using certificates and consumers are just starting to use them.

Secure sites are sometimes designated with "https://...", rather than "http://...". Netscape builds SSL security into its Navigator browsers and into some of its servers, the first being the Netscape Commerce Server.

SSL is a protocol that allows many variations, that runs over TCP/IP. A major strength is that it is independent of the protocols like HTTP that run above it. It is used to carry a record securely across the Internet and to:

- Authenticate the server, and optionally the user.
- Ensure the communication between browser and web server is private.
- Ensure the transmission is reliable, assuming the underlying TCP/IP network behaves well.

SSL can be used for any record and is relatively low level. It is only designed to connect client and server, not for multi-vendor situations. A typical transaction involves buyer, seller and credit card authorizer at a minimum, hence more complex security protocols are being designed.

Exhibit IV-5 gives the workflow for how SSL is used to securely transmit a record, such as a credit card number, over the Internet.

Client sends CLIENT_HELLO:

- Contains Challenge field, equivalent to "Mother's Maiden Name" or other data commonly used by banks to recognize a user.
- Contains information on cipher used by the server, such as algorithm used and key length; for example an exportable version of Netscape may use 40 bits whereas a U.S. version may use 128 bits.
- Wells Fargo bank rejects a client for its online banking system if it only has a 40-bit key implementation.

Server sends SERVER_HELLO:



- Responds to client by sending its certificate from a registered authority like VeriSign.
- Sends specifications of encryption used for the record that will be encoded after the key exchange phase, usually the lowest common denominator between browser and server.

Client sends CLIENT_MASTER_KEY:

- Before sending the message the client verifies that the certificate is good, the first time this is sent the client user may just have to trust that if the server looks genuine and sends a certificate that looks genuine it probably is genuine.
- The web server merchant may also send the challenge to the user by another route, such as the phone, fax or in an e-mail message, not foolproof, but increases the security somewhat.
- Assuming the client accepts the certificate it has a trusted copy of the server's public key.
- It then generates new symmetric keys from the public key and sends these back to the server, encrypting them with the server's public key.

Server sends SERVER_VERIFY:

- The server knows the encryption algorithm used by the client and its public key, hence with its secret key it can decrypt the new encoding of the symmetric keys sent to it from the client.
- If SSL is implemented with good algorithms and long enough keys, no ~~man~~ ^{one} in the middle is likely to intercept the encrypted symmetric keys ~~while in transmission~~ ^{during} because the secret key is known only to the server.
- Now client and server have new keys that can be used to encrypt the sensitive data.
- The server sends the challenge back to the client and the client validates the exchange.

Client sends CLIENT_FINISHED:

- The client closes out the handshake by sending a message to the server.

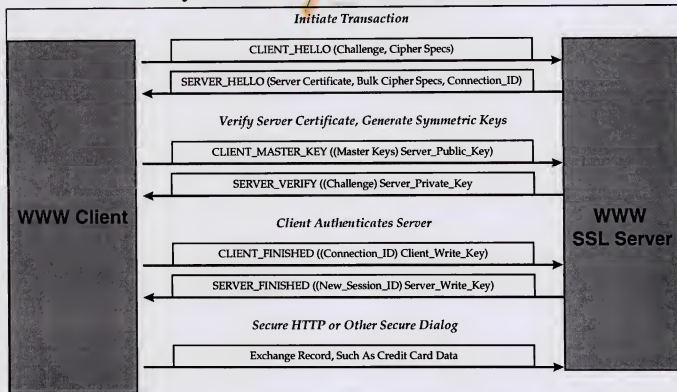
Server sends SERVER_FINISHED



- The server closes out the handshake by sending a message to the client.

Exhibit IV-5

Payment Process For Soft Goods Using SSL



Source: INPUT

2. Typical Merchant

Any merchant already trading today using credit cards on their own web site is likely to use SSL.

3. Advantages

Netscape freely offers SSL as a standard, although it charges for its secure servers; hence it has become very widely accepted. There is no per-transaction cost for using the standard.

SSL can secure any record, not just HTTP.

SSL is widely deployed in web servers which means that merchants can easily secure credit card and other sensitive data.



4. Disadvantages

The security is only between client and server, not for complex transactions involving intermediaries.

If buyers do not have certificates, the server cannot know whether they are genuine. anyone can steal a computer with a user ID and password and pretend to be someone else (for that matter they could steal a computer with a certificate in it if it was not protected in a wallet!).

Buyers without certificates can repudiate the message, ^{and} hence the merchant may be left with returned inventory.

Exported browsers currently have shorter keys than domestic U.S. ones, making them unusable for secure transactions at some sites, such as Wells Fargo Bank.

Unless the purchaser is a frequent visitor to an SSL site, the initial form filling asking for name, address, e-mail address, mother's maiden name, etc., gets tedious, slowing down Internet shopping.

5. Security

The key exchange described above did not authenticate the user, as the user did not have a certificate. The protocol does allow the server to ask the user for a certificate. However, in the future, the server will ask the user for a certificate.

Much of the security depends on the quality of the certificate authority (CA). Supposing an entity issued false certificates and pretended to be VeriSign, this would be a major fraud that would render the protocol insecure.

Much depends on the way SSL is implemented, it is only as strong as its weakest keys and algorithms. With a reasonable SSL implementation (good encryption algorithms, reliable TCP/IP network, long enough key lengths), buyers and sellers need not worry about eavesdroppers.

6. Market Acceptance

SSL has been widely accepted by web server vendors. Thousands of merchants offer SSL servers that can encrypt credit card transactions over the Internet.

7. INPUT Assessment

SSL, ^{though} while a relatively simple mechanism, has proven useful in enabling credit card transactions over the Internet. It will be part of the SET standard.

SSL ^{was} has been used in 1995 and 1996 to differentiate web servers. Users ^{id} pay a premium ^{for} for a web server that supports SSL.

However, SSL is becoming a commodity that will no longer be able to command a higher price. With the advent of SET, users will look for more capable web server features.

On the client side, SSL implementations do not need a wallet; the user certificate, if there is one, is stored with the browser. Whenever users encounter an SSL-enabled browser, they end up filling in forms and answering questions about the site.

The merchant does not usually store a credit card number, ^{though} however there are exceptions.

Amazon.com, the bookstore with over 1 million books, uses a Netscape Commerce server and does keep credit cards on file.

The user may be spared entering credit card data at each visit to the store, but Amazon.com gets many of its book reviews entered by users.

The trend is towards users entering personal information for SSL-enabled servers that can then be used for tracking down system abusers, subsequent site visits and targeted marketing.

Open Market, with OM-Transact operational at Time-Warner, MCI and First Union Bank, was the first vendor to provide application software that acts as a cash register for processing credit card and other transactions.

The attraction of Open Market's solution is that it separates payment from content, so a merchant can keep the web site content, ^{and} whereas the bank can handle payment processing.

Netscape and Microsoft are also offering Merchant Systems, servers to process merchant payments. These servers enable shopping carts to be set up.

Currently Internet shopping ^{the} website user interfaces range from superb, as found at bookstore ^{to} amazon.com, ^{to} complex. The field research conducted for this project indicates that the majority of merchants have yet to implement shopping carts.



Visa/Mastercard SET

1. Process

SET (Secure Electronic Transactions) is a proposed standard from Visa and Mastercard for processing credit cards over the Internet. It came from Visa's Secure Transaction Technology (STT) standard and Mastercard's Secure Electronic Payment Protocol (SEPP) standard in February 1996.

American Express announced ^{that} it would license Microsoft's SET implementation in the first half of 1996. Additional partners include:

- GTE
- IBM
- ~~Microsoft~~
- Netscape
- SAIC
- Terisa Systems
- VeriSign

Already Internet commerce software vendors, like RSA, have made significant commitments to the protocol.

The main advantage of SET over SSL is that, like a credit card, it associates merchant and buyer with a financial institution and credit card company, providing an additional degree of security.

The problem with SSL is that the transaction is unencrypted at the merchant site and depends on the merchant's firewalls and other security to keep it safe from attack. This puts the bank at risk.

SET puts the onus on the bank or card processor to keep the transaction secure.

By early 1997, SET will start to be used as the leading standard for credit card payments.

Initially, VeriFone will offer SSL between the browser and merchant and SET between the merchant and credit card acquirer (acquiring bank or credit card processor), thus bridging the transition to full SET transactions.

SET's goals are:

- Provide authentication of ~~both~~ merchants and retailers
- Ensure payment integrity

on schedule?

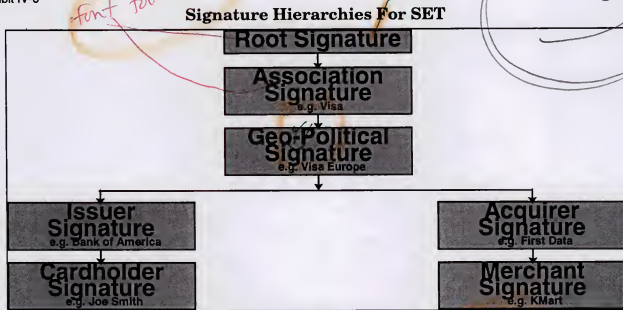


- Ensure confidentiality of information

In addition, SET aims to comply with government cryptography restrictions.

Signatures follow a hierarchy to comply with regional legislation. Each signatory has two sets of public/private key pairs, a Signature Key and a Key-Exchange Key. The public keys are made known to those requiring them using Certificates under the certification hierarchy illustrated in Exhibit IV-6.

Exhibit IV-6



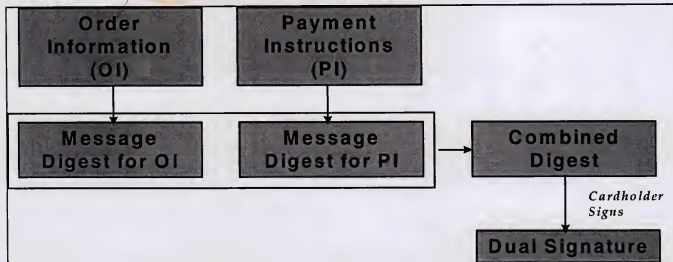
The public key of the root of the Certificate Authority (CA) hierarchy will be widely distributed as part of the SET software implementations. The Association will verify keys for the Geo-Political organization, where one exists. The Issuer, normally a bank, will issue certificates to cardholders.

The SET specification includes an online registration procedure for existing credit cardholders and merchants in which they use software to generate their key pairs and ask their issuers and acquirers to create certificates for them.

SET is a standard for payment, not general electronic commerce. Exhibit IV-7 shows diagrammatically how order and payment information are linked.



Exhibit IV-7

Order and Payment Information

Source: SET and INPUT

The SET system creates separate digests of the order and payment information. These are concatenated to make a combined digest that is signed by the purchaser using his private key.

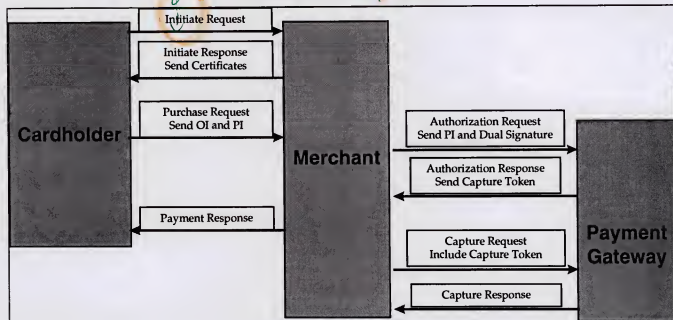
Any person who possesses one component of the message and message digest for the other component can verify the dual signature. Possibilities are:

- Merchant - has order information and digest for payment instructions
 - can fulfill order without knowing credit card numbers
- Acquirer - has payment instructions and digest for order information
 - can process credit card information without knowing order details

Exhibit IV-8 shows *the* diagrammatically a typical transaction flow between cardholder, merchant and payment gateway for making a payment using SET.



Exhibit IV-8

Transaction Flow For SET

Source: SET and INPUT

The first SET action is to initiate a request to a merchant. The merchant responds with a copy of their certificate to prove they are genuine and as acknowledgment.

The payment gateway is connected to the existing credit card verification system by an acquirer who uses a private secure network to carry transaction information. The cardholder encrypts payment instructions, using the public key of the payment gateway to encrypt the credit card information and the public key of the merchant to encrypt the order.

The encrypted order, payment information and dual signature are sent to the payment gateway by the merchant for verification.

A capture token comes back from the payment gateway to the merchant, analogous to the authorization code familiar to credit card purchases. A response is sent on to the cardholder.

The merchant then sends the purchase request with the capture token back to the payment gateway, that acknowledges it.

The timing of sending the response to the cardholder from the merchant may vary. Some will want authorization from the acquirer, others will reply immediately to the cardholder, without verification.



SET allows for variations in the basic process, which resembles that of traditional credit card processing.

Mastercard does not initially intend to offer cardholders certificates, meaning that they cannot have digitally verifiable signatures.

Visa will require cardholders to generate their own keys and have them certified by a Visa acquirer.

GC Tech of France aims to be a European CA. [Visa envisions the same digital signature being used "on the net" as "on the street".]

In reality, there will be multiple CAs, who will need to define zones of mutual trust. Candidate CAs are VeriSign, Visa, NACHA, the US Post Office and CyberCash.

How do these 2 sentences relate?

2. Typical Merchant

The typical merchant will be an existing credit card merchant. Some new merchants who have Internet only businesses will emerge, but most merchants will have "on the net" and "off the net" presence.

3. Advantages

SET is sponsored by leading credit card companies, software companies, acquirers, and banks.

Uses familiar credit card processing infrastructure.

It provides authentication of both buyer and seller (Mastercard will not authenticate the buyer initially using SET digital certificates).

The use of wallets should make it easier to create smooth and easy-to-navigate user interfaces, as well as transaction logging for the wallet owner.

4. Disadvantages

SET is unsuitable for low-cost items, costs 30 cents to process a transaction, 2% to 6% fee for merchants.

5. Security

SET provides non-repudiation of consumers and blinding of merchants to credit card information.

It is considered superior to SSL because it links the merchant to a payment processor and the merchant does not handle credit card numbers.



CyberCash's pioneering system is not open, but will move to SET.

Initially setting up certificates with a user and a merchant can be tedious, but the process is expected to accelerate as companies set up customer service representatives that can handle Internet transactions.

6. Market Acceptance

Visa and Mastercard claim over 800 million cardholders, worldwide. This standard is expected to be widely implemented by year end 1996.

A reference implementation of SET is available free of charge to vendors. Mastercard and Visa provide considerable support on their web sites for the standard.

The goal of SET is to be in operation for Christmas 1996. Whereas this may happen for a few sites, widespread deployment is more likely by Christmas 1997.

SET has had

Wide adoption by the industry; a few participants are listed below:

- Credit card companies - Visa, Mastercard, American Express, Discover
- Server software vendors - Netscape, Microsoft, O'Reilly, Oracle
- Systems vendors - IBM, Sun, Silicon Graphics, Digital, Compaq
- Commerce application companies - Open Market, Connect, Broadvision
- Point-of-sale vendors - VeriFone, ICVerify

7. INPUT Assessment

Certificate Authorities

CAs are likely to evolve like the bank ATM networks, Cirrus and Plus. They started out by working with a few banks; but eventually more banks became connected and they connected to overseas networks like UK-based Link.

This then enables international funds transfers to be made rapidly. International Internet payments will be facilitated by agreements and network interfaces between CAs.

CAs will require the highest levels of security and be targets for intruders and hackers.

It is desirable that there be more than one CA per country and that data be distributed and secured with data recovery systems. Security will have to be at least as high as that offered by a bank.

How consumers will store their certificates is an open issue. Wallets have been proposed, but these are inconvenient if they stay on a desktop computer.

General Magic and Sony have announced home banking on a PDA. One scenario is that the wallet is encoded in a smart card that can be read by a PC, but then the advantage of having a wallet encoded in data only disappears.

Specialized electronic organizers that pay checks are starting to appear; ^{perhaps} maybe these will evolve into wallets. Telephones could also hold wallets.

The most likely scenario is to store the wallet information in a card or organizer that can be transmitted to a PC with a simple connection, such as an infrared link.

Initially, cards will be for a single CA; then a bank or other service institution could consolidate multiple consumer identities on a single card.

Banks are already offering Visa debit cards and ATM cards on one piece of plastic, so the trend towards putting multiple identities on a card is already ^{beginning} emerging.

Wallet software is already available for paying bills through EFT from Intuit. The Quicken Financial Network is Intuit's private network for bill paying. Intuit uses 1024-bit public key encryption from RSA.

~~Whereas~~ ^{but} paying regular bills is a different process from shopping, where bill payments are less regular ultimately the consumer may want one wallet.

As Intuit battles Microsoft in the consumer financial software market, it is still an open issue whether Quicken Financial Network will be a dark horse in the payment area and compete with CyberCash and VeriFone.

It is expected that transaction logs from SET wallets will be able to operate with Quicken and other financial management software, just as Quicken interfaces to bank and credit card accounts.

Credit cards will be the predominant form of payment, for both consumers and businesses, for occasional purchases over \$10.

Competition from micropayment schemes for this type of purchase will be slow in coming because the infrastructure is already in place for credit card processing.



Merchants will be afraid to move to newer micropayment schemes as long as there are several options, for fear they ^{will choose} pick the wrong standard.

FSTC checks may offer competition by 1998, but like the competition between credit cards and travelers' checks, SET is likely to win.

J

Checklist for Payment Methods

Any payment system can be measured against the following desirable features:

- A store of value
 - heavy cash is less convenient than a plastic card
 - for computer users, a card may be less convenient than storing data on the computer disk
- Wide acceptance
 - national currencies are becoming obsolete as credit cards become globally accepted
- Low cost, easy user interface
 - ^{SP}ATM machines prove too difficult for some users, like the elderly and blind
- Automatic data capture and aggregation
 - some users want anonymity
 - some countries like the U.S. make extensive use of credit card data; ^{countries that} in others it is illegal
- ^Einsure ^{that} the transaction is satisfactory
 - both user and merchant must be satisfied each is genuine
 - users must have the funds, merchants must be able to deliver the goods
 - beyond individual transactions, ^{must} currencies need to be backed up by assets, banks need reserves, new payment schemes ^{must} also need to be solvent



- Insurance against loss or theft
 - some forms of payment like Travelers Checks can be replaced; others cannot be; some have limits
 - besides insuring the payment vehicle, a card issuer may choose to provide some insurance against bad purchases or unsatisfactory transactions
- Line of credit
 - Prices of obtaining a line of credit may vary under different schemes
- On-demand convertibility to other payment systems
 - credit card issuers may offer cash withdrawal at ATMs for a fee
 - exchanging cash may be harder than using a credit card in a foreign land
 - the Internet potentially threatens national currencies and economies as global buyers and sellers emerge
- Privacy
 - some transactions are totally anonymous, like cash and some forms of digital cash
- Settlement and clearing time
 - the purchaser likes to use the float
 - merchants like to be paid fast

No ^{single} payment method offers all the above features. Trade-offs have to be made. Buyers and sellers may have incompatible requirements, for example regarding ideal settlement and clearing time.

Exhibit IV-9 provides a comparison of how emerging payment methods compare with the features listed above. The exhibit columns are split across several pages and the first column of each table on each page is the same.



Exhibit IV-9

Feature Comparison of Payment Methodologies

Feature	Cybergash Coin	DigiCash - ECash	First Virtual
Stored value	No, instruction to pay	Yes	No, instruction to pay
Wide acceptance	Yes, likely leverage through partners	No, both parties ^{currently} must use the same bank today. Cannot be passed on to third parties. ECash can only be used for one transaction.	No, Internet only
Ease of use	Yes, wallet simplifies buying	Fair, user has to keep track of transactions and pre-pay for ECash from a bank	Poor
Data capture	Yes, wallet log and CyberCash	No, software has a local log, but user is responsible for aggregating and safekeeping of the log	Yes, credit card statement
Satisfactory transactions	Unclear; for low value items it may not matter	No, as with real cash	Yes for buyer, no for seller
Insured against loss	Yes, CyberCash keeps log	No, unless user backs up disk. One can get a refund if the seed number for coin serial numbers is presented to the bank.	Credit card risk \$50
Line of credit	No, coin is pre-paid	No	Yes, 25-30 days to pay
Convertible to other systems	Coin can go into checking account	Yes, for a fee can be deposited into a checking account	No
Privacy	Merchant does not know buyer, but CyberCash does	Yes for consumer, no for merchant. Payer can prove who he paid. Received ECash has to be deposited into a bank.	No, FV knows details
Quick clearing	Fair, next banking day for consumer, possibly for merchants, more likely 2-3 days for merchants	Yes, it is pre-paid. Merchant gets paid at time of deposit.	No, seller may wait 30 days

Source: INPUT



Exhibit IV-9 cont.

Feature Comparison of Payment Methodologies (cont.)

Feature	FSTC E-check	Mondex
Stored value	No, instruction to pay	Yes
Wide acceptance	No, requires banking network, POS investments and consumer card readers or wallets Potentially it could be used for peer-to-peer payments	Likely, but not yet. Today both parties must use the same bank, but in the future it will become global supporting 5 currencies in one card. Can be passed to third parties.
Ease of use	If card issuing is easy, then as simple to use as a credit/debit card. Processors could reduce paper handling costs significantly.	Wide range of devices supported with appropriate modifications - ATMs, smart phones, POS card readers, PC card readers.
Data capture	Yes, at POS or in PC. Bank statement could show full check details.	10 transactions are saved in the card, user is responsible for capturing more details from PC software or a wallet log.
Satisfactory transactions	No, depends on same criteria as paper check; verification of funds is needed.	No, this is cash and depends on merchant's return policy.
Insured against loss	Not needed, as check can be rewritten and it is less subject to fraud than paper checks.	No, the wallet enables users to store higher value amounts there; the card is intended for small amounts.
Line of credit	Depends on bank account.	No
Convertible to other systems	Yes, can be converted to cash at a bank.	Yes, can be deposited into a checking account
Privacy	No, bank will have transaction record, rather than just those over \$300 as now.	Some can be passed on to third party. Seller has complete records.
Quick clearing	No, payee has to deposit before it can clear, plus 1 or 2 days settlement.	Yes, this is cash.

Source: INPUT-1

Exhibit IV-9 cont.

Feature Comparison of Payment Methodologies (cont.)

Feature	SET Credit Card	SSL	Visa Australian Trial
Stored value	No, instruction to pay	No, instruction to pay	Yes
Wide acceptance	Yes, 700 million Visa and MC card holders, plus Purchasing Cards in corporations	Fair, only on Internet	Yes, large installed base that can be persuaded to upgrade Not for peer-to-peer
Ease of use	Yes, wallet standards	Fair, user may tire of forms	Yes, can use at ATMs and POS
Data capture	Yes, wallet log and credit card statement	Yes, user captures data	All transactions captured and aggregated at point of purchase
Satisfactory transactions	Merchant is guaranteed funds if signed, authorized transaction; consumer is backed by credit card company	Yes for buyer, no for seller	No, this is cash, depends on merchant return policy
Insured against loss	Yes, like credit card \$50 max risk	Credit card risk \$50	Yes, like travelers' checks
Line of credit	Yes, 25-30 days like credit card	Yes, 25-30 days like credit card	No
Convertible to other systems	No, except for high-fee cash advance. Convertible worldwide into other currencies.	No	Yes, can be deposited into a checking account
Privacy	No, merchant and transaction processor have information on buying patterns	No, merchant sees details	No
Quick clearing	Fair, merchant paid in 2-3 days	Fair, merchant paid in 2-3 days	Yes, this is cash

Source: INPUT



V

User Awareness

A

What Users Want From A Payment System

1. What Do Businesses Prefer In A Payment System?

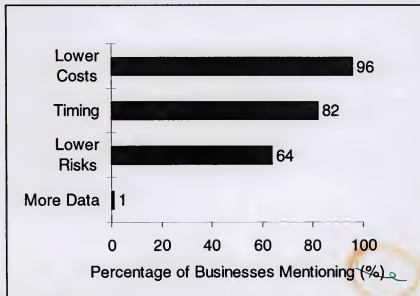
In early Mondex cash card trials, merchants in Swindon (U.K.) enjoyed using the system because handling electronic data cost less than handling cash or checks. Merchants also like to get paid fast. Giving a merchant instant credit is an advantage over other slower payment methods.

Digital signatures and other security features are attractive to merchants who are victims of bounced checks, false signatures and fake currency.

Exhibit V-1 indicates what businesses prefer in a payment system.

Exhibit V-1

Business Reasons for Preferring a Payment System



Source: INPUT



2. What Business Thinks Consumers Want

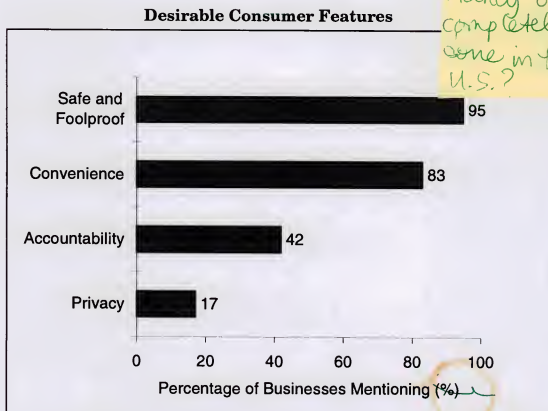
INPUT's market survey, conducted in the U.S., where privacy is considered less of a concern than in Europe, requested businesses to identify what they believed consumers wanted. The results are shown in Exhibit V-2.

Safety and foolproof operation are uppermost. This is why banks are very cautious about exposing their risk by putting too much cash into a cash card. Any adverse publicity about hackers, security breaches or unreliable systems causes loss of consumer confidence in the banking system.

Convenience is the next requirement, hence the preference for convenient credit card-sized smart cards by banks.

Businesses think that consumers are less interested in privacy and accountability. This survey was mainly done in the U.S., where privacy is less of a concern than in Europe.

Exhibit V-2



Source: INPUT

3. Which Payment Systems Will Businesses Prefer?

Exhibit V-3 shows use and planned use of different payment systems by business.



As mentioned earlier, 90% of businesses plan to use Purchasing Cards. This is the most widespread payment option in terms of percentage of businesses penetrated.

Financial EDI (FEDI) is used by 84% of companies and a somewhat lower percentage either use or plan to use EDI over the Internet.

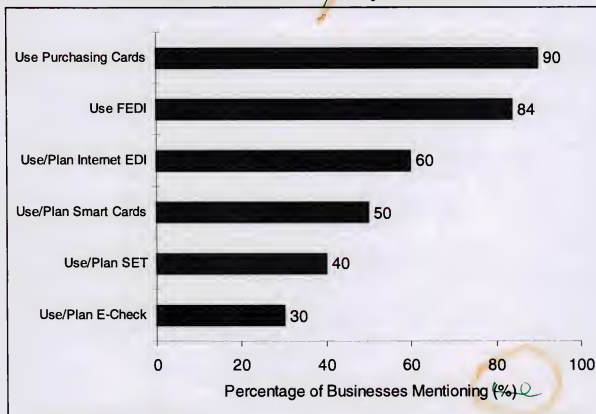
It is not surprising that only 50% of businesses plan to use smart cards as they are most likely to be used by retailers, banks and consumers initially.

SET, for sending credit card payment over networks is only planned by 40% of businesses, but this is likely to increase as products that use the standard become available.

Electronic checks were not seen as useful, for only 30% of businesses used or planned to use them. Many businesses preferred a preference for paper checks as they support their business processes and provide a permanent transaction record when they are returned.

Exhibit V-3

Planned and Current Use Of Payment Methods



Source: INPUT



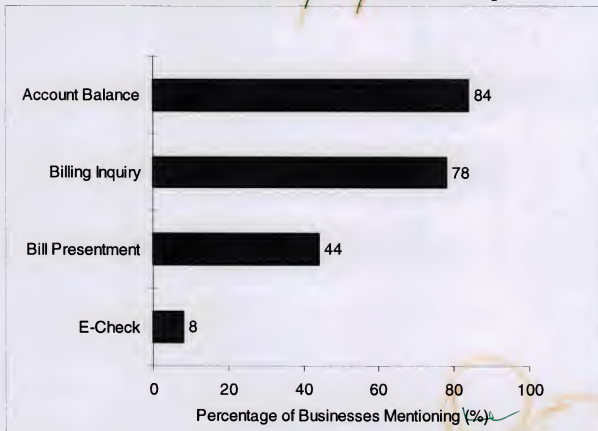
4. Desirable Consumer Services

Businesses were asked to comment on what services they thought consumers would use. Bill presentment to deposit money in a bank was seen as less desirable for consumers. Electronic checks did not rank highly, with only 8% of businesses thinking that consumers would find e-checks desirable.

Exhibit V-4 shows that account balancing and billing inquiries were the most useful.

Exhibit V-4

Desirable Consumer Services From A Business Perspective



Source: INPUT.

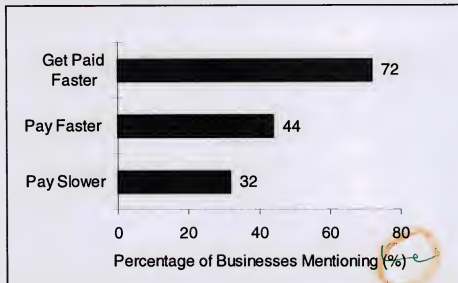
5. How Will New Purchasing Methods Affect Payment Timing?

Exhibit V-5 shows how businesses think electronic payment methods will affect the timing of payments. Most think they will get paid faster, which is true with some of the electronic cash schemes compared with credit card payments.

Almost half (44%) think they will be able to pay their bills faster. Some think payment will be slower. Some think that using credit cards instead of checks will give them more time to pay.

Exhibit V-5

How New Purchasing Methods Will Affect Payment Timing



Source: INPUT

B

Purchasing Cards

1. Are Purchasing Cards Prevalent?

although purchasing cards were Introduced only *four* years ago, Visa and Mastercard estimate that nearly 100% of the Fortune 100 and 60% of businesses with over \$100M in revenue will have some Purchasing Card (Pcard) program in place by year end 1996. *\$1 billion*

Companies are adopting Pcards to reduce the cost of making a small purchase. The typical purchasing process costs between \$20 and \$80 per transaction in administrative resources, *the process* often more than the value of the goods being purchased. *it comprises:*

- Requisition
- Approval
- Purchase Order
- Ship Receipt
- Invoice
- *three* \$-Way Match
- Check Sending

Credit card companies can deliver timely reports on Pcard purchases, saving users clerical work. Pcards enable Internet commerce for businesses. There is no need for a buyer to set up a purchasing relationship or establish trade credit.

Credit cards are unsuitable for most primary commerce purchases where long-term supply contracts will continue to predominate. Pcards are likely to be used for purchasing:

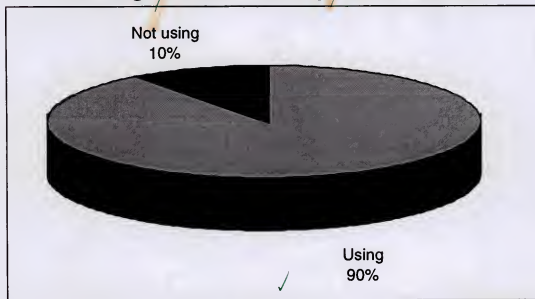
- Software
- PCs - when not part of a bulk order
- Office supplies
- Copiers and related servicing
- Laboratory components - in small quantities
- Medical supplies
- Miscellaneous equipment parts
- Books
- Information

It is likely that Web sites selling to business will offer online payment by credit card routinely in 1997.

Exhibit V-6 shows the survey result that only 10% of businesses do not use some kind of credit or other Purchasing Card. This is somewhat higher than the Visa and Mastercard estimates.

Exhibit V-6

Percentage Of Businesses Using A Purchasing Card



Source: INPUT



Exhibit V-7 shows how businesses rank perceived benefits of a purchasing card program.

Their main interest is in reducing procurement costs. Spending limits are typically set per month and per transaction.

Larger volume businesses typically have no fee and receive up to 30 days credit.

Accounting departments can aggregate the entire amount on a card and rely on reports produced by the credit card company for account details. For companies that want more detailed reporting (Level 2 or Level 3 POS detail), electronic accounting information is available in most cases.

Purchasing card programs can improve employee morale by making them feel more in control and in charge of their own small purchases.

Purchasing cards enable employees to participate in Internet commerce from their workplace. Purchasing cards should simplify acceptance of Internet commerce in business.

Methods that support e-checks and POs will lag ^{behind} SET credit card payment systems by about a year in their deployment to most businesses.

2. Purchasing Card Transaction Amounts

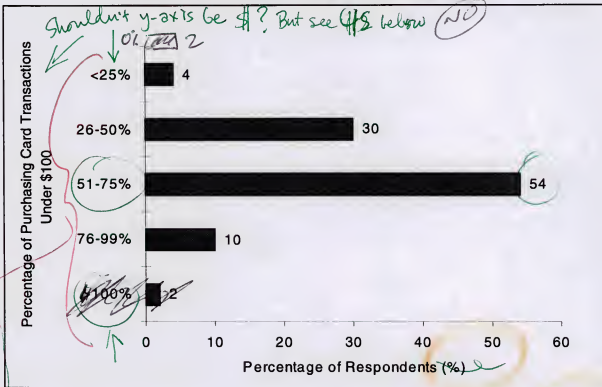
Exhibit V-8 shows the percentage of respondents, ^{of} from those using Purchasing Cards, that used their cards for different amounts of purchases under \$100.

↑ see note next pg



Exhibit V-7

Amount of Purchase Using Purchasing Cards



Source: INPUT

Almost none (2%) only used them for purchases over \$100. Most respondents (54%) had between 50% and 75% of their transactions under \$100.

Only 4% had less than 25% of their purchasing card transactions under \$100. Roughly one-third of the respondents had greater than 50% of their transactions to purchase over \$100 amounts.

Purchase cards are not just for small transactions, hence moves by Visa and Mastercard to raise purchasing limits on corporate cards.

3. Purchasing Cards For Maintenance, Repair and Office Transactions

Given that a company has defined small Maintenance, Repair, and Office (MRO) transactions that can be made on Purchasing Cards, what proportion of these transactions are actually made using them?

Exhibit V-8 shows what percentage of MRO purchases were made using Purchasing Cards. The majority (58%) of respondents used their cards for 20-40% of MRO transactions.

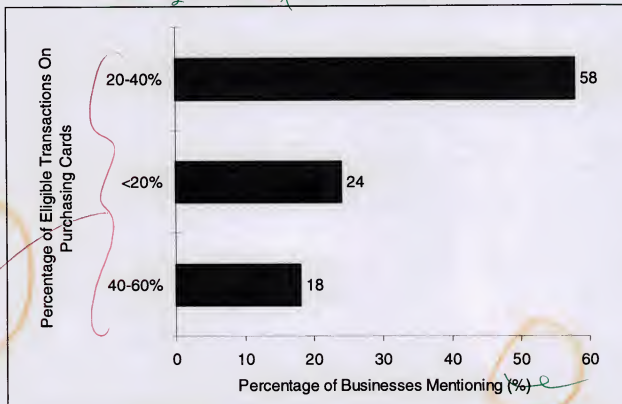


No respondent used Purchasing Cards for all their MRO transactions, but 18% said they used them for 40-60% of MRO transactions.

Whereas office and maintenance expenses are paid for by Purchasing Cards in some instances, other options like purchase orders are likely to remain. *open*

Exhibit V-8

Percentage
Amount of Purchase *made* Using Purchasing Cards



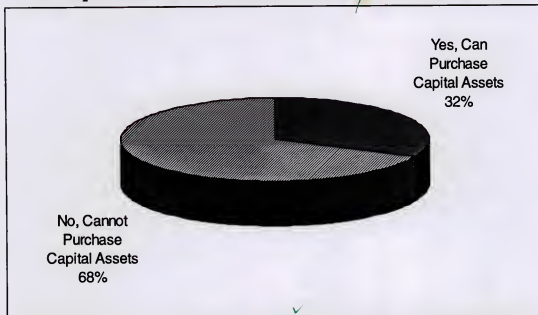
Source: INPUT

4. Purchasing Card Use For Capital Expenditures

Exhibit V-9 shows the percentage of respondents (32%) that allowed the use of Purchasing Cards for capital assets.



Exhibit V-9

Can Capital Assets Be Purchased Using A Purchasing Card?

Source: INPUT

It is not surprising that Purchasing Cards are used for purchase of capital assets, by only $\frac{1}{3}$ of organizations, given that:

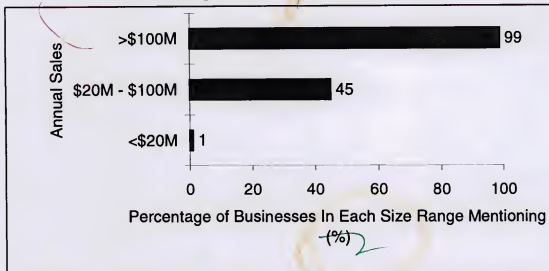
- Many organizations have different budgetary cycles and signing authorities for capital expenditures.
- Capital budgets may have to be planned as much as a year in advance.
- Purchasing Cards are unsuitable for capital expenditures when long term contracts with suppliers are in place or bulk purchases of items like computer equipment are made by a central organization.

5. Purchasing Card Use By Size Of Business

Exhibit V-10 shows the use of Purchasing Cards by company size.



Exhibit V-10

order OK
Purchasing Card Use By Business Size

Source: INPUT

Overall, 90% of businesses used Purchasing Cards. Almost all (99%) large companies, with over \$100M in annual sales, use Purchasing Cards. In the small businesses, with less than \$20M the sample size was small, but only 1% used Purchasing Cards.

Individual credit card use is more likely in very small businesses, with reimbursement after the individual has paid.

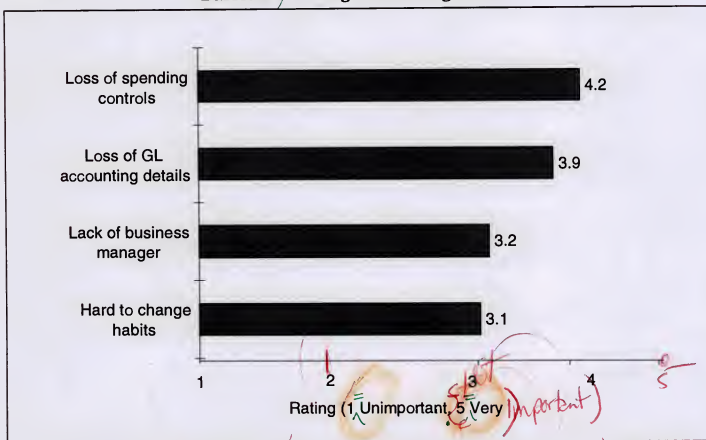
6. Barriers To Using Purchasing Cards

Exhibit V-11 shows the perceived barriers to using Purchasing Cards.



Exhibit V-11

Barriers To Using Purchasing Cards



Source: INPUT

The ^{greatest} concern is loss of control over spending. In some corporations, accounting departments want to account for every penny; other cultures do not need to micromanage, for example, how many laser toner cartridges were purchased.

Calculating sales tax is a burden for some accountants if items are not accounted for individually.

If only merchant name and totals are captured with Level 1 reporting, then sales tax can only be estimated and exempt items such as services and food (in some states) may be accounted for ^{incorrectly} wrongly.

With a purchasing card program a corporation pays a bank, rather than many smaller institutions.

Whereas companies can delay payment to a few small suppliers, they find it hard to do this with their credit card issuer. This may cause cash-strapped companies ^{to avoid} from encouraging Purchasing Card use.



Management resistance to using Purchasing Cards, stems from their losing control. *POs often have budget numbers attached that belong to individual departments, whereas Purchasing Cards may not track spending to the departmental unit.* *a sense of*

Managers are also afraid of changing their habits. Many prefer the purchasing department to take care of buying items, rather than burdening their own secretaries or themselves with the chore. *that*

Companies with well-designed online requisition purchases that send e-forms to the purchasing department may be reluctant to supply purchasing cards to many employees.

Card limits are another barrier to the use of purchasing cards. If multiple cards are issued for an account it is sometimes difficult to understand when the credit limit is reached. *free tell*

C

Use Of The Internet and World Wide Web

1. Pros and Cons of Internet-based Payments

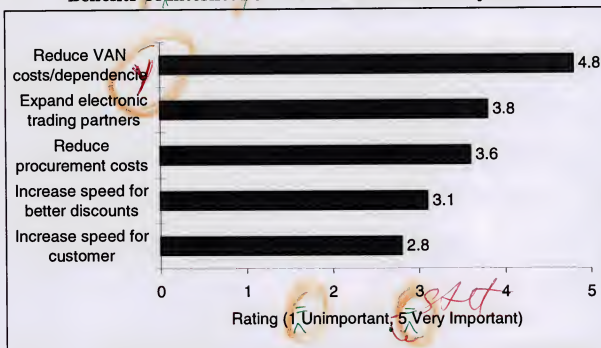
Exhibit V-12 shows the benefits businesses perceive of using the Internet for payment on a scale of 1 to 5, 1 being unimportant and 5 being very important.

in inc VAN per transaction pricing schemes make the Internet appear attractive for some businesses that use EDI. Businesses without EDI expect that the web will enable them to buy with more choice, ease, speed and at lower administrative cost. *free*

If Internet checks had same night clearing this could provide businesses with an opportunity to provide a trade discount. Increased processing speed could also help businesses pay faster, increasing customer satisfaction and goodwill.



Exhibit V-12

Benefits Of Internet For Business-to-Business Payments

Source: INPUT

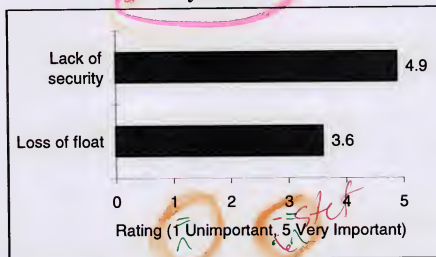
Exhibit V-13 shows that lack of security and loss of float are the two concerns businesses mentioned.

The survey results showed little awareness of security schemes such as the SET protocol for credit card payment over the Internet among its respondents. There was also little awareness of commerce transaction systems from companies like Broadvision, Open Market, and Connect. Instead fear of security breaches was prevalent among respondents.

Businesses also indicated that they would miss the float associated with paper checks.



Exhibit V-13

Barriers to Internet Acceptance for Business-to-Business Payments

Source: INPUT

Exhibit V-14 shows the benefits businesses see of the Internet for consumer-to-business payments.

Over 50% of companies were planning to sell some of their company products over the WWW by mid-1997. Even businesses selling expensive capital goods were interested in using the web to sell replacement parts, upgrades and supplies.

The lowest interest in Internet Commerce was found in the wholesale grocery industry, a segment threatened by improved distribution. This industry has already invested in inventory replenishment, electronic links to customers and automatic handling systems and does not see additional advantages to be gained from the Internet.

Increasing sales is the main reason that businesses are interested in the web.

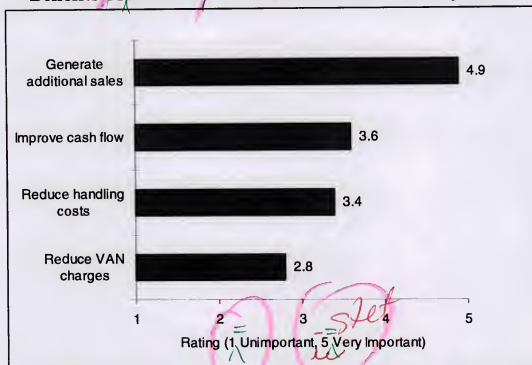
Improving cash flow by reducing order processing time is attractive. The Internet promises to change the "net 30 day" payment terms to "ship within 48 hours after credit card verification". The faster settlement time for credit card payments makes it worth the 2% merchants have to pay in many cases.

Non-EDI users were particularly interested in the Internet for reducing paper processing and phone order taking costs.

Integrating accounting systems with web sites was of considerable interest.



Exhibit V-14

Benefits Of Internet For Consumer-to-Business Payments

Source: INPUT

The survey results shown in Exhibit V-14 indicate why merchants are reluctant to accept Internet-based payments.

Security is once again uppermost. System costs and lack of standards were also concerns.

When INPUT probed merchants who were the most Internet savvy, they believed that payment systems that relied on software, rather than hardware like wallets and Mondex cards, cost less to implement.

Merchants, unlike some banks, were prepared to accept the greater security risks of a software system. Credit card transactions with SET were felt to be secure enough.

For all the payment systems, lack of standards was a concern.

For check truncation, large billers are waiting to see if FSTC, NACHA, ECCO or the Federal Reserve will set the standards as they all have different ways to capture and process check images at the point of payment.

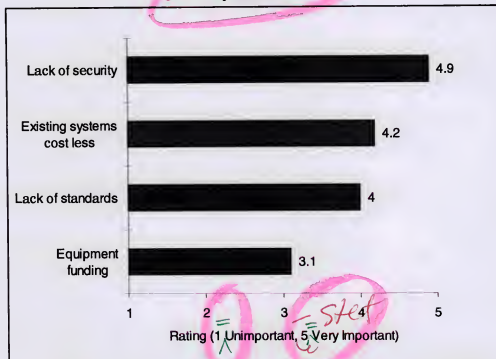
Large billers have made considerable investments in check processing systems, some with imaging and have achieved low processing costs. They



believe moving to a new e-check system may increase processing costs initially, hence paper checks are likely to continue to be used for some time.

Exhibit V-16

Barriers to Internet Acceptance for Consumer-to-Business Payments



Source: INPUT

2. Use Of The World Wide Web

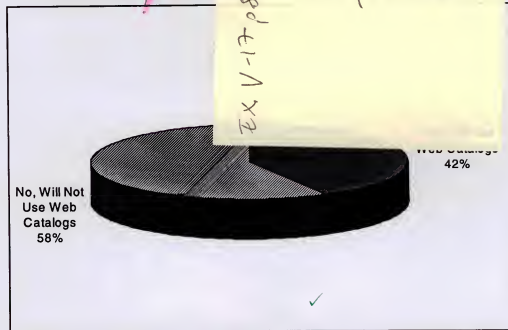
Exhibit V-17 shows how many companies plan to use the WWW to purchase from business catalogs in the next year.

The majority (58%) do not plan to use web catalogs. There is an increase in Web catalog use from INPUT's 1995 study on Electronic Catalogs and Malls, when very few purchasing managers even used the Internet.



Exhibit V-17

Percentage Of Respondents



Source: INPUT

3. How Will Users Purchase On The Web?

Exhibit V-17 shows the percentage of respondents that are likely to use a Purchasing Card to buy from business catalogs on the WWW in the next year.

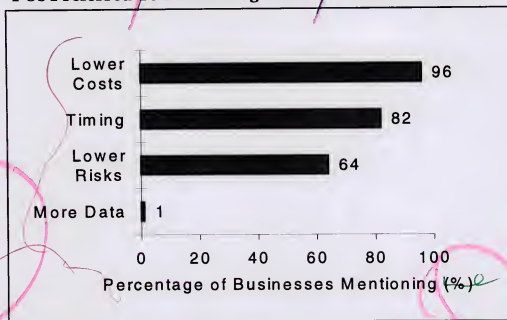
The majority of respondents (90%) plan to continue using purchase orders to complete the transaction. This will change over time as electronic payment methods advance. However, it shows many businesses do not trust or cannot use Purchasing Cards to pay for goods and services from web catalogs. These survey results indicate that:

- Vendors do not accept credit card payment
- The amounts are too high, or
- Corporate policies prevent Purchasing Card use

Purchasing Card use is expected to be much higher in the U.S. than in Europe because of more widespread acceptance of credit cards.

PROPERTY OF THE UNIVERSITY OF CALIFORNIA

Exhibit V-18

POs Preferred To Purchasing Cards For Web Purchases

Source: INPUT

4. Will EDI Systems Affected By The Internet?

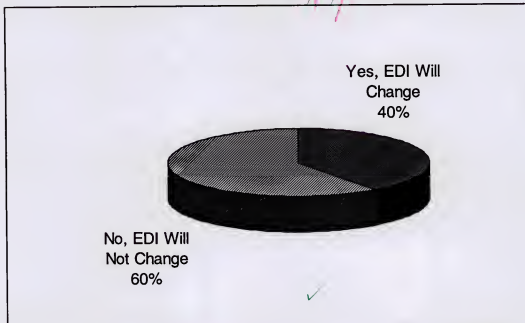
Exhibit V-19 shows that 40% of respondents expecting their EDI systems to change because of the Internet. This is good for vendors that supply Internet-based EDI systems (like Premenos).

All the traditional EDI service vendors are embracing the Internet, so they should be able to sell new services to a high proportion of their customers.

It will be a challenge for them not to lose customers to payment processors, Internet-savvy banks, or Internet web hosting providers that offer merchant services.



Exhibit V-19

Will EDI Change Because Of The Internet?

Source: INPUT

5. Use Of Credit Card For WWW Purchases

Exhibit V-20 shows what businesses expect to buy with a credit card using the WWW.

The highest percentage (88%) intend to buy software. This is consistent with the Internet Shopping Network's view that software is one of the most popular items they sell from their web site.

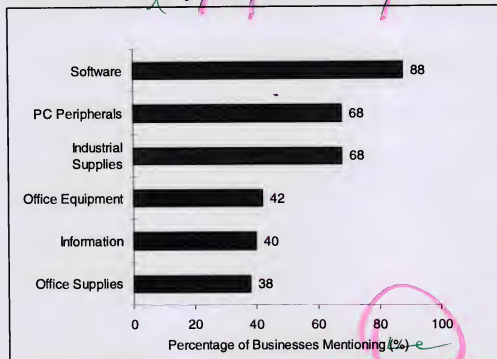
PC peripherals also appeal to technically savvy buyers.

Fewer (42%) would buy office equipment over the web. This may be because there is no established web supplier yet, although many companies, including OfficeMax are already selling over the Internet.

Only 40% want to buy information over the web, this is somewhat low, but many businesses run on internal, rather than externally available information.



Exhibit V-20

What Will Business Buy From The WWW With A Credit Card?

Source: INPUT

6. Use of Purchase Orders For WWW Purchases

Exhibit V-21 shows which products and services are most likely to be purchased using a traditional Purchase Order (PO).

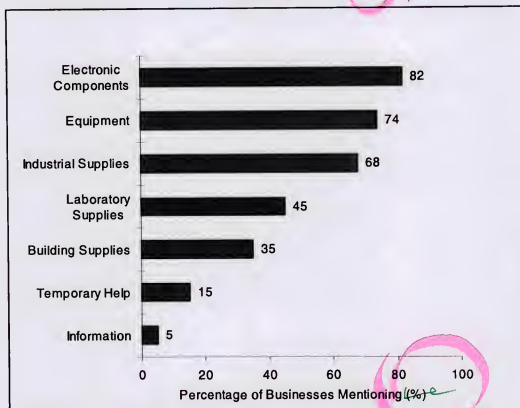
As mentioned earlier, equipment and industrial supplies are likely to be on POs.

Far fewer businesses, 5%, would purchase information using a PO, compared with 40% that would use a credit card.



Exhibit V-27

What Will Business Buy From The WWW With A Purchase Order?



Source: INPUT

D

Electronic Checks and Online Coins

1. Who Are E-Checks Good For?

Exhibit V-22 shows what business thinks Electronic Checks will be used for. The overwhelming majority (75%) think their greatest use will be for consumers to pay businesses.

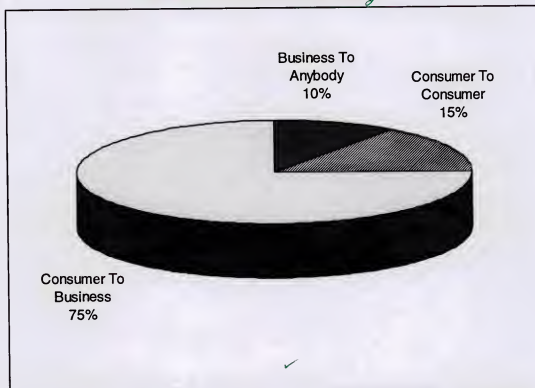
Businesses like paper checks and do not see themselves converting to e-checks very quickly.

Few (15%) think that consumers will use e-checks to pay each other.



Exhibit V-22

How Used Who Are E-Checks Good For?



Source: INPUT

2. Competition For Electronic Checks

Electronic checks are advantageous mainly to the check processing community; business has much less interest in them. Exhibit V-22 shows what businesses think will compete with electronic checks.

Most (92%) think that bill payment services like the Quicken Financial Network from Intuit, IBM's Integriion and CheckFree, not to mention services by established EDI and payment processing vendors, will compete with E-checks.

These systems already integrate with a company's accounting system and even if the check is not entirely electronic, because unsigned bank drafts are generated in the process, the interface to the user is familiar and simple.

The electronic check vendors need to focus on making the back-end of these systems fully digital.

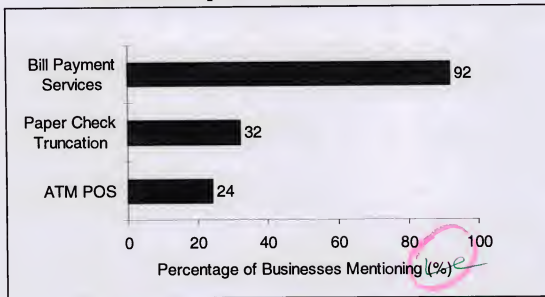
Paper checks are still of interest and 32% of businesses think that conventional paper checks that are not sent back to the payer (i.e. their processing is truncated) will be the main competitor.



In some businesses, ATM and POS equipment will be used as it is now for depositing checks and making payments, as well as receiving money.

Exhibit V-23

What Will Compete With Electronic Checks?



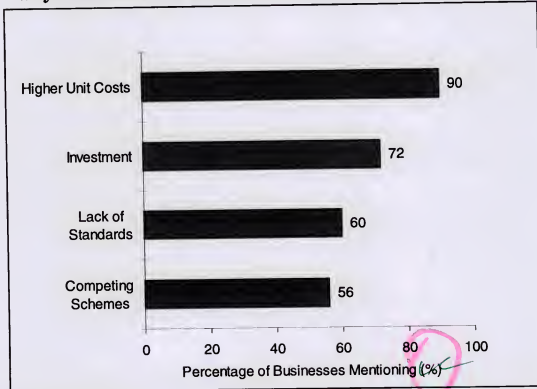
Source: INPUT

3. Obstacles To Adopting Electronic Checks

The most promising segment for e-checks is for consumers to pay businesses. However, even this segment does not appear to be very promising as Exhibit V-24 indicates.



Exhibit V-24

Why Businesses Are Reluctant To Support Electronic Checks

Source: INPUT

Businesses believe that consumers are unlikely to use e-checks to pay businesses. Most (90%) believe that costs will be higher and 72% see the investment they would have to make as a barrier.

Lack of standards is an issue and 56% of businesses believe there are competing schemes that will win out. (See Exhibit V-23).

There is considerable uncertainty about e-checks at this time.

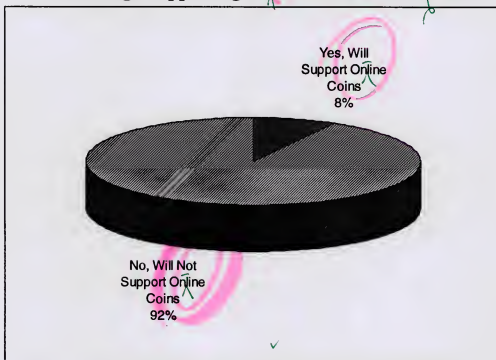
4. Online Coin Outlook

Exhibit V-25 shows the percentage of businesses that expect to support online coins or e-cash in the next two years.



Exhibit V-2\$

Percentage Supporting Online Coins Within 2 Years



Source: INPUT

E

Cash Cards

1. Market Timing

Exhibit V-2\$ shows when businesses expect the use of cash cards like Visa Cash and Mondex to impact their organization.

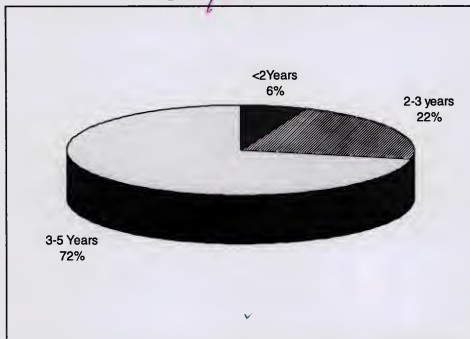
Only 6% think they will affect their operations in less than 2 years. However, in 2 to 3 years, that is in the 1998-1999 timeframe, a further 22% think they will have an impact.

The remaining 72% see cash cards as further out.

In Europe and Asia cash card use is more prevalent than in the U.S., where niches are expected to accept the cards first. Some of the early users are telephone companies, restaurants and retailers in towns picked for a trial by a major vendor.



Exhibit V-26

Impact Of Cash Cards

Source: INPUT

2. Disposable Versus Reloadable Cash Cards

Cash cards can either be disposable or reloadable. Exhibit V-27 shows what the banks and businesses felt that the maximum amount should be on disposable cash cards.

Most (58%) felt they should not hold more than \$25, but greater than \$10. A more conservative 14% felt they should hold no more than \$10. However, 16% felt the limit should go up to \$100.

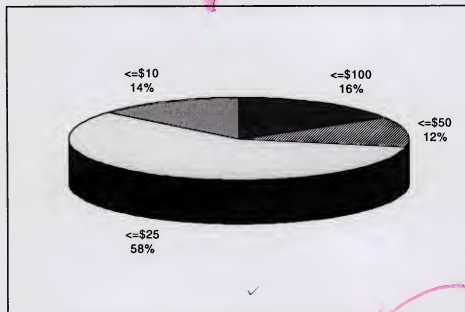
In the Mondex system, very little is expected to be carried on the card, maybe enough for lunch, a newspaper and a cappuccino.

More electronic cash will be stored in a wallet or PC, maybe as much as \$500.

Much depends on the card's use; a restaurant patron may want to have more on the card than a school child making local phone calls worth 25 cents.

Exhibit V-27

How Much Should A Cash Card Store?

Source: INPUT
Source: INPUT

Cash cards may be refilled from a credit card over the phone or they may be placed in an ATM machine that is capable of reloading a card from a bank account.

Exhibit V-28 shows desirable features for reloadable cash cards.

The biggest feature is accountability. Merchants want to be able to add up their receipts quickly and if they issue cards track how they are being requested. Merchants want guarantees against bad debts and stolen cards.

Simple memory-based cards are easy to counterfeit. Those with processors are harder. France reduced fraud by 70% when it changed from simple cards to those with a processor on board.

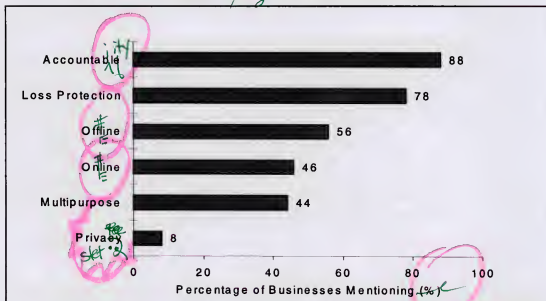
For merchants, offline systems tend to cost less, don't take time at the POS terminal, and can provide them with simpler network administration. Against that, online systems can provide instant verification of funds and may uncover fraud faster than online systems.

Both online and off-line systems are desirable, with a slight preference for off-line systems. Cash cards that are multipurpose make administration easier for the user. Merchants can read them through one POS terminal. Privacy, to some extent a feature of cash cards depending on the exact

implementation, is seen as much less desirable than other features by businesses. A higher percentage of consumers would rate privacy highly.

Exhibit V-28

Desirable Features For Reloadable Cash Cards



Source: INPUT

Exhibit V-29 shows business perceptions of obstacles to the adoption of reloadable cash cards. The biggest, particularly in the U.S., is the prevalence of credit and debit cards. There are also many brands of cash cards, whereas the credit card market has a few major players.

With products like Visa Cash, even the cash cards may be controlled by a few large players. Only 24% thought merchant acceptance was a barrier to using reloadable cash cards.

In general, based on trials, it appears that merchants like handling cash cards because they save the time it takes to give a customer change and of adding up till receipts.



Exhibit V-29

Obstacles To Adoption Of Reloadable Cash Cards

Source: INPUT

Exhibit V-30 shows merchants' ranking of perceived benefits of using cash cards. Potentially merchants believe the time saved in counting and transporting cash to be the most important benefit.

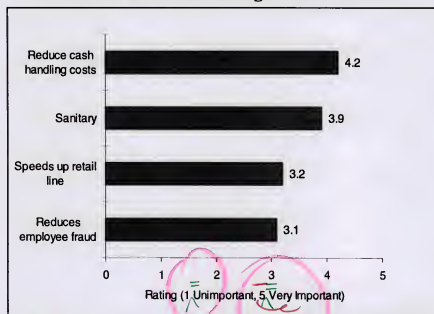
Food handlers like cafés and restaurants believe that using cash cards is more sanitary.

Some believe that cash cards reduce the time purchasers spend at the till; others believe it increases it.

Reduction of fraud is another benefit.

Exhibit V-30

Perceived Benefit Ranking of Cash Cards



Source: INPUT

Exhibit V-31 shows a ranking of business perceptions of the obstacles to the adoption of cash cards.

Cost of equipment, in particular point-of-sale systems and card readers, is seen as the greatest barrier to implementation. For merchants to capitalize on smart cards, widespread acceptance is needed to amortize the cost of equipment across many purchasers.

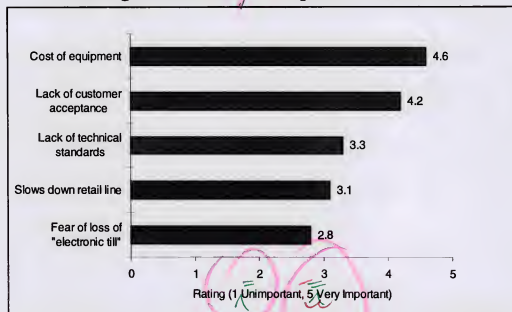
Pilot schemes that flood a town with smart cards are likely to be a useful marketing strategy for any company wanting to enter a market.

Another barrier is the changes that consumers will have to make, which may prove costly. *Mondex* assumes, for example, that the consumer will buy the accessories to check the card balance and lock and unlock it. Debit cards are perceived as free, because they use existing systems.

Given the plethora of schemes for stored value cards, merchants are still dubious about standards. Initially, merchants may have to absorb the upfront cost of installing smart card systems in anticipation of future cost savings. This also presents an opportunity for banks and others to lease systems and equipment on favorable terms.



Exhibit V-3

Ranking of Obstacles To Adoption of Cash Cards

Source: INPUT



VI

Issues

This chapter compares issues regarding emerging payment systems for payment system providers, merchants and payers.

A

Issues for Payments System Providers

Payments system providers may be network service operators, payment processors or vendors. Exhibit VI-1 compares how emerging payment systems compare from the provider perspective.

Exhibit VI-1

Comparison of Payment Systems Issues For Payment Systems Providers

Acceptance Issue	Cybercash Coin	Mondex	DigiCash cash	SET Credit Card	E-check
Nonproprietary system	N	N	N	Y	Y
Lower level protocol independent	Y	N, offline	Y	N	Y
Security - hardware or software	SW	HW	SW	SW	HW
Additional hardware needed in network	N	Y	N	Y	Y

Source: INPUT

Payment providers need to understand the role they undertake in providing service:

- To what extent should they become Internet service providers?
- What types of services should they provide?

Another concern for banks is how they back-up and keep reserves for their electronic cash.

When a bank issues electronic money it comes out of a checking account, for which legal reserve requirements are in place. The bank needs to be subject to the same reserve requirements for electronic money in circulation issued from its accounts.

Regulations still need to be established for digital payment schemes.

B

Issues for Merchants

Exhibit VI-2 ^{shows} compares how emerging payment systems compare, regarding issues raised earlier in the report.] !

Exhibit VI-2

Comparison of Payment Systems Issues For Merchants

Acceptance Issues	Cybercash Coin	Mondex	DigiCash E- cash	SET Credit Card	E-check
Additional POS hardware	N	Y	N	N	Y
Widely accepted long term	Y	Y	N	Y	Y
Easy to use	Y	Y	N	Y	Maybe
Offline - no need to check with bank	N	Y	Y	N	N
Ease of funds transfer to a conventional bank	Y	Y	N	Y	Y

Source: INPUT

Merchants have many systems issues:

- Should they outsource or manage their own web site?
- Should they rely on a bank or service provider to do their Internet payment processing? They may already have a relationship with a bank, but an Internet service provider may be offering service today and the bank may not be ready. Also a service company like First Data may offer more attractive services than a bank.
- What software and hardware do they need to buy and what can be used on a timesharing system?
- How should they staff their technical support requirements, with technical experts or support experts like clerks and retailers?



C

Issues for Purchasers

Exhibit VI-3 compares ^{the issues of} how emerging payment systems ^{as they affect} compare for purchasers.

Exhibit VI-3

Comparison of Payment Systems Issues

Acceptance Issues for Purchasers	Cybercash Coin	Mondex	DigiCash E-cash	SET Credit Card	E-check
Low payer setup cost	Y	N	Y	Y	N
Peer-to-peer transfer of value possible	N	Y	Y	N	Y
Anonymous	N	Y	Y	N	N
Affiliated with financial institution	Y	Y	N	Y	Y
Backed by government	N	N	N	N	N
Portable	N	Y	N	N	Maybe
Pay before (PB), Pay now (PN), Pay later (PL)	PB	PB	PB	PL	PN

Source: INPUT

In addition to the above issues, Consumers are interested in their rights to privacy. They want to know when and where information will be disclosed. They also want protection against loss or theft.

Any payment system issuer must be prepared to arrange for high level support to report stolen cards, reissue payment instruments if part of the scheme and answer customer questions.

D

Legal and Regulatory Issues

1. Current Regulators and Regulations

In the U.S., Banking Authorities, Taxation Authorities and Law Enforcement Organizations are involved in the regulation of electronic payment systems. Exhibit VI-4 compares their concerns.



Exhibit VI-4

Concerns of Regulators

Banking Authorities	Taxation Authorities	Law Enforcement
• Citizen protection, access, disclosure, risk of loss, issuer default, privacy • Safety and soundness - operating malfunctions, settlement risk, bank failures, issuer identity, seignorage • Aiding law enforcement with detection of counterfeiting, money laundering, tax evasion	• Citizen protection, raising revenue for public goods, privacy • Aiding law enforcement with detection of tax evasion, money laundering	• Citizen protection, organized crime, drug peddling, terrorism, privacy vs. Surveillance • Bank protection, counterfeiting • Taxation system protection, money laundering, income and sales tax evasion

Source: INPUT

All of the organizations listed above have been dealing with regulating electronic networks for funds transfer long before the Internet became popular.

In the U.S., agencies concerned with regulation include the Department of the Treasury's FinCEN (Financial Crimes Enforcement Network), NSA (National Security Agency), FBI (esp. U.S. Caribbean Task Force), CIA, U.S. Department of Justice (Asset Forfeiture and Money Laundering Section, Anti-Drug Profiteering Unit), assorted state level Gaming Control and Taxation departments.

Internationally the Financial Action Task Force (FATF), an entity set up by the G7, exists to combat money laundering.

It is worth bearing in mind, amid press scares that:

- All ATMs have daily limits
- Most emerging electronic payment systems are accountable with central data repositories that provide inexpensive access for authorities
- All systems, except disposable cards, require a bank account, which cannot be opened anonymously in most places, hence cash flows can be monitored
- Anonymous disposable cards are not any more portable than paper currency. Reloadable cards are not anonymous and they are assigned to individual bank accounts
- If one spends \$10,000 of DigiCash ECash then it will be apparent to the issuing bank as it can only be used once. The government may not be



able to find where it was sent, but it can certainly investigate in traditional ways.

- The U.S. 1988 Money Laundering Act requires all banks, financial firms and merchants to report transactions above \$10,000 and all purchases of financial instruments above \$3,000.
- The Bank Secrecy Act requires banking institutions to keep records of all transactions over \$100 for at least five years and ~~must~~ ^{to} keep an image, such as a digital check image or microfilm check picture.
- The U.S. Financial Privacy Act prevents banks from giving or selling these records to other commercial organizations.
- The potential for automated surveillance of the Internet could significantly intrude on the privacy of users.
- The Mondex merchant system keeps detailed transaction records ~~which~~ ^{that} would make sales tax evasion difficult.
- Over the next five years, regulations that enable law enforcement to snoop on electronic transactions over the Internet are likely to be defined.
- The Clipper chip initiative met with considerable resistance, but the government will identify ways to monitor the Internet and users will resist regulation.

2. Regulation E

An excellent reference on the impact of electronic money on the money supply is given in a paper presented at the Conference on Digital Cash and Electronic Money organized by the Columbia Institute for Tele-Information, at the Columbia Business School, April 21, 1995 by the New York Federal Reserve at:

<http://startide.ctr.columbia.edu/citi/history/emon.html>

Legislation is changing quickly. In May 1996, modifications were made to Regulation E, the Electronic Funds Transfer Act for stored value cards.

Stored value cards that are subject to verification at the time of purchase would essentially be subject to the same rules as credit cards. Erroneous transactions would need to be reported in 60 days by consumers.

In addition, the Federal authorities propose changing the definition of "written" communications that are signed on paper to include electronic messaging that is "authenticated similarly" (i.e. in practice "signed digitally" or signed with a security code) by the user.



The Federal Reserve has authorized digital signing for recurrent transactions, such as paying bills. NACHA, May 1996, extended the bill to cover non-recurring debits and credits using ACH networks.

3. Digital Signatures

California's AB 1577 regulations recognized digital signatures being valid signatures for electronic communications, subject to certain qualifying criteria, and was passed in October 1995.

Gradually states and countries are starting to create legislation around digital signatures and authentication of electronic documents.

Utah was the first state in the U. S. to set up legislation for Certificate Authorities and digital notaries, who can be liable for issuing fraudulent certificates. This moves some of the risk from banks and merchants to certificate issuers.

4. Taxation

In November 1996, the Clinton administration announced that it has no plans to impose new federal taxes on the Internet.

The Treasury has been studying the implications on tax policy of electronic commerce. Its discussion on this subject can be found on the Treasury Department's home page at www.ustreas.gov.

State and local taxation, not to mention international taxes and rules for exemption from taxes become an issue for electronic funds. Various task forces, including the Software Industry Coalition are working on the issues. Their initial paper can be found at:

<http://www.softwareindustry.org/issues/docs-htm/usetaxwp.html>

Ideally, states and cities would create a settlements process as found in banking and telecommunications, to solve check clearing and phone bill payment, respectively. Authorities could tax the sale of goods based on the ZIP code of the recipient.

Given government spending restrictions this is unlikely to happen. Instead there will be the system that prevails now, where mail order companies charge according to laws of specific states, which often imply only recipients in a few states pay taxes.

In fact, the law requires purchasers to pay use tax. Typically this is only collected on cars, boats, and large items by a few states.



A major international issue is tax evasion and avoidance. Entire communities have been built offshore to support this business and the same types of electronic communities can expect to evolve.

A non-political monetary system that became popular would cause upheavals in the financial system. There is no law against offering a digital currency at present. However, technically it could not be used to pay a debt.

5. Fraud and Money Laundering

The most vulnerable payment schemes are those that allow anonymity.

Fear of money laundering has made suppliers of payment systems provide safeguards, such as knowing the merchant or encrypted chips to foil money launderers. The main risk is transferring digital cash overseas where it may be undetected.

Banks are increasingly at risk of harboring money launderers. A bank that has a money launderer client can be shut down in the U.S. Exceptions are made when banks attempt to make their systems legal and existing systems are attacked.

Electronic payments systems offer money launders opportunities to "cool" their hot money.

The government is increasingly relying on banks to police ^{their own} customers.

Service providers can increasingly expect to be held responsible for activities that involve financial transactions. This may be a deterrent to service providers providing payment processing and an incentive for banks, like First Union in Florida, to manage the financial aspects of web commerce.

Banks are going to qualify customers with more questions about the nature of their transactions, e.g. "Do you expect to make large payments?" "To which overseas countries do you expect payments to be made?" "Yes" and "Colombia" being answers likely to alert suspicion.

Banks will be likely to investigate payments to fiscally tolerant countries.

Asset forfeiture and identification of trading partners with strong money laundering legislation is a major issue for regulators and global financial institutions.

Money laundering is largely accomplished in one of four ways:

- Take payment in cash or other bearer instruments and deposit in a bank in a country that has bank secrecy laws — the biggest risk is

detection on leaving a country like the U.S., where travelers cannot carry more than \$10,000 in negotiable instruments

- Buy a legitimate cash business and run money through it, like a dry cleaning service or restaurant
- Buy a bank — international interbank transfers are a key problem area. *the problem lies in identifying a fraudulent banker, not in the networks per se*
- Convert cash to goods

The problems above are personnel problems more than technological problems. Corrupt banks and payment processors that use the Internet will be a likely problem for authorities.

Another type of fraud is duplicating the e-mint or creating false payment instruments. Software, dollar bills and coins have all been counterfeited and there will be opportunities to detect real from fake smart cards, digital wallets, and digital signatures.

6. Unlicensed Online Banks

Regulators will not tolerate unlicensed online banks.

Banks are subject to regulation and are expected to follow them. *slide by it.*

With digital cash and other non-national currencies there are opportunities to set up virtual banks. These can increasingly be expected to be closed down by regulators if they do not adhere to strict guidelines.

Non-bank financial institutions are typically regulated by states in the U.S.

There are cyberspace equivalents starting to appear that may fall foul of state legislation.

*other
ways around*



A

Glossary

Need to set up
proper tabs:
Definition
Term

This appendix provides definitions of terminology associated with the Internet that is not in INPUT's *Definition of Terms*.

A

Definitions

ACH (Automated Clearing House) An organization that runs a financial network and clears electronic funds transfers

Application protocol An application protocol is a protocol that connects an application across a network, usually above the transport layer (e.g., TCP/IP). Examples include HTTP, TELNET, FTP, and SMTP.

Asymmetric cipher An encryption scheme where one side has the key and the other does not as in private key cryptography

ATM (Automatic teller machine) is almost always the use of the acronym in this report. Sometimes it can mean a switched network type as in Asynchronous Transfer Mode, but that is not the usual meaning here.

Audit The collection of information about security events on a network. Auditing is used for logging events, identifying network attacks, and ensuring that network security is working effectively.

Authentication Verification of the claimed identity of a computer or computer network user.

Backbone A high-speed line or series of connections that forms a major pathway within a network. The term is relative, as a backbone in a small network may be much



smaller than many non-backbone lines in a large network.

- Bandwidth** How much information can be sent through a connection. Usually measured in bits per second. A full page of English text in a book totals around 20,000 bits. A fast modem can move about 30,000 bits in one second (30Kbps), rising to around 120,000 bits per second (120Kbps) depending on the type of information being transferred and the compression used. Full-motion, full-screen video would require roughly 10,000,000 bits per second (10Mbps), depending on compression.
- Bit (Binary digit)** - a single digit number in base 2; in other words, either a one or a zero. The smallest unit of computerized data. Bandwidth is usually measured in bits per second.
- Block cipher** an encoding algorithm that operates on data in groups of bits, called blocks; 64 bits is a typical block size.
- Browser** A client program (software) that is used to look at (or browse) various kinds of Internet resources. Microsoft Explorer and Netscape Navigator are two examples of browsers.
- Bulk cipher** A symmetric encryption algorithm that encrypts large data streams.
- Byte** A set of bits that represents a single character. Usually there are 8 or 10 bits in a byte, depending on the processor architecture.
- Certificate** part of the CCITT X.509 protocol (a.k.a. ISO Authentication framework) assigned by a trusted Certificate Authority that provides identification of an entity, person or merchant. It may also supply its public key.
- Cyberspace** Currently used to describe the whole range of information resources available through computer networks such as the Internet.
- Data Encryption Standard (DES)** DES is a very widely used symmetric encryption

algorithm. DES is a block cipher.

Digital Signature Standard (DSS)

A standard for digital signing, including the Digital Signing Algorithm, approved by the National Institute of Standards and Technology, defined in NIST FIPS PUB 186, "Digital Signature Standard," published May 1994 by the U.S. Dept. of Commerce.

Digital signatures

Digital signatures use cryptography to produce a data string that can be authenticated, and is difficult to forge or repudiate.

DNS (Domain Name Server) — a means by which numeric IP addresses (e.g., 198.93.130.56) are converted into character-based names (e.g., www.input.com) and vice versa.

Domain Name The unique name that identifies an Internet site. Domain names always have 2 or more parts, separated by dots—for example, 'input.com.' The part on the left is the most specific, and the part on the right is the most general. A given machine may have more than one domain name, but a given domain name points to only one machine.

e-cash electronic cash, proposed by DigiCash and CyberCash.

e-checks electronic checks, proposed by FSTC.

E-mail Electronic mail / messages, usually textual, sent from one person to another via computer. E-mail can also be sent automatically to a large number of addresses via a mailing list.

e-money electronic money such as digital cash, ACH transactions, e-checks.

EDI (Electronic Data Interchange) — traditional business-to-business protocols and formats for exchanging ordering information electronically.

EFT Electronic Funds Transfer

Electronic cash encrypted data that represents cash and can be sent over networks to pay for goods and services.



- Encryption** A method of protecting data so that if it is accessed, it cannot be understood without the use of a secret encryption key.
- Ethernet** A network standard for connecting computers in a LAN. Ethernet will handle about 10Mbps and can be used with almost any kind of computer. Fast Ethernet handles 100Mbps, in practice speeds are lower than the rated capacity of the network.
- FAQ** (Frequently Asked Questions) - FAQs are documents that list and answer the most common questions on a particular subject. There are thousands of FAQs on subjects as diverse as pet grooming and cryptography. FAQs are usually written by people who have tired of answering the same question many times. FAQs are often associated with Usenet newsgroups.
- Fast Ethernet** The latest Ethernet standard that specifies a data transfer rate of 100Mbps, a tenfold increase over traditional Ethernet performance.
- FDDI** (Fiber Distributed Data Interface) - a standard for transmitting data on optical fiber cables at a rate of approximately 100Mbps.
- FEDI** (Financial EDI) the payment protocols and standards that follow an EDI message to order goods in business-to-business electronic commerce.
- FTP** (File Transfer Protocol) - a very common method of moving files between two Internet sites. FTP is a special way to log in to another Internet site for the purpose of retrieving and/or sending files.
- Host** Any computer on a network that is a repository for services available to other computers on the network. It is quite common to have one host machine provide several services, such as Web and Usenet.
- HTML** (HyperText Markup Language) - the coding language used create hypertext documents for use on the World Wide Web.
- HTTP** (HyperText Transport Protocol) - the protocol for moving hypertext files across the Internet. Requires an HTTP client



program at one end and an HTTP server program at the other. HTTP is the most important protocol used in the World Wide Web today.

2#
Hypertext Generally, any text that contains "links" to other documents – words or phrases in the document that can be chosen by a reader and which cause another document to be retrieved and displayed.

Internet The vast collection of interconnected networks that all use the TCP/IP protocol and that evolved from the ARPANET of the late 1960s and early 1970s.

IP Address A unique number consisting of 4 numbers separated by dots. Every machine that is on the Internet has a unique IP address – if a machine does not have an IP address, it is not really on the Internet. Most machines also have one or more domain names that are easier for people to remember. For example, the IP address of www.input.com is, at the time of writing, 198.93.130.56.

IRC Internet Relay Chat – a large, multiuser live chat facility. There are a number of major IRC servers around the world that are linked to each other. Anyone can create a channel and everything that any member of a channel types in is seen by all users in that channel. Private channels can be created for invitation-only conference calls.

ISDN Integrated Services Digital Network – a 64Kbps digital telephone line connection. ISDN acceptance is still low due to high equipment prices, but as prices fall, individuals and companies are benefiting from leased-line performance on a dial-up line. Connection time charges are normally the same as for a regular analog telephone connection.

ISP Internet Service Provider – an organization (usually commercial) that offers individuals and other organizations access to the Internet through a dial-up connection, ISDN, or leased line.

JEPI Joint Electronic Payment Initiative

Kb Kilobyte 1,024 bits. Abbreviated to Kb

Someone please confirm!
See Adam



Kilobyte 1,024 bytes. Abbreviated to KB.

LAN (Local-Area Network) - a computer network limited to the immediate area, usually the same building or floor of a company building.

Leased line A phone line that is permanently held open for data transfer between two locations. The highest speed data connections require a leased line.

Listserv The most common kind of mail list, Listservs originated on BITNET, but they are now common on the Internet.

Login The account name used to gain access to a computer system or network.

Mail list An automated system that allows people to send E-mail to one address, whereupon their message is copied and sent to all of the other subscribers to the mail list. In this way, people who have many different kinds of E-mail access can participate in discussions together.

Megabit 1,024 kilobits. Abbreviated to Mb.

Megabyte 1,024 kilobytes. Abbreviated to MB.

Message Authentication Code (MAC)

A Message Authentication Code is a one-way hash computed from a message and some secret data. Its purpose is to detect if the message has been altered.

MICR magnetically encoded information at the bottom of a check.

Micropayment usually small payments; in reality it means a payment that can be made with a smart card or digital cash. Nanopayments and picopayments are even smaller payments.

MOTO applies to retailers that sell using mail order, telephone order, *or these methods* (MOTO).

MRO Maintenance, Repair, Office expenses; typically small expenses that corporations are likely to put on purchasing cards.

Which
year - 1996
or 1997?

NACHA (National Automated Clearing House Association) - industry group that sets standards for ACHs.

Node Any single computer connected to a network.

One-way hash function

A one-way transformation that converts an arbitrary amount of data into a fixed-length hash. It is computationally hard to reverse the transformation or to find collisions.

Packet Switching The method used to move data around on the Internet. In packet switching, the data coming out of a machine is broken up into chunks, each chunk containing the address of where it came from and where it is going. This enables chunks of data from many different sources to coexist on the same lines, and be sorted and directed to different destinations by special machines along the way. This way, many people can use the same lines at the same time.

Password A code used to gain access to a locked system. Good passwords contain letters and non letters and are not simple combinations.

PIN (Personal Identification Number) - used like a password to make transactions more secure.

POS (Point of sale system) - typically a cash register or computer acting as a cash register.

PPP (Point-to-Point Protocol) - most well known as a protocol that allows a computer to use a regular telephone line and a modem to make a TCP/IP connection and thus be on the Internet. PPP is gradually replacing SLIP for this purpose.

Proxy Server (Proxy) An application that controls traffic between a protected network and the Internet.

Public key cryptography

A class of cryptographic techniques employing two-key ciphers. Messages encrypted with the public key can only be decrypted with the associated private key. Conversely, messages

signed with the private key can be verified with the public key.

Purchasing cards Corporate credit/debit cards, typically used to make smaller purchases

RC2, RC4

Proprietary bulk ciphers from RSA Data Security, Inc.

RFC (Request For Comments) - the name of the result and the process for creating a standard on the Internet. New standards are proposed and published online, as an RFC. The Internet Engineering Task Force is a consensus-building body that facilitates discussion and establishes new standards.

Router A software package or special-purpose computer that handles the connection between two or more networks. Routers spend all their time looking at the destination addresses on the packets passing through them and deciding which route to send them on.

SET Standard for credit card transaction handling over the Internet

T1 A leased-line connection capable of carrying data at 1.544Mbps. At maximum theoretical capacity, a T1 line could move a megabyte in less than 10 seconds. That is still not fast enough for full-screen, full-motion video, for which you need at least 10Mbps. T1 is one of the fastest speeds commonly used to connect networks to the Internet.

T3 A leased-line connection capable of carrying data at 44.736Mbps. This is more than enough to transmit full-screen, full-motion video.

TCP/IP (Transmission Control Protocol/Internet Protocol) - a collection of communication protocols that define the Internet and allow different computers to communicate with one another over a common network.

Telnet The command and program used to log in from one Internet site to another. The telnet command/program gets you to the "login:" prompt of another host.

B

Further References

A comprehensive bibliography of electronic payment systems is maintained at Stanford University, with URL <http://robotics.stanford.edu/users/ketchpel/ecash.html>.

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A page of defs. is missing (but more pagination)
(they're on screen)

B

Vendor and Association Names and Addresses

Exhibit B-1 lists the names and addresses of some leading vendors of Internet payment and web technology.

Exhibit B-1

Names and Addresses of Vendors

Company	Product
Amdahl Corporation 1250 East Arques Avenue Sunnyvale, CA 94088 U.S.A. Tel: 1 800 538 8460 FAX: 408 773 0833	www.amdahl.com
Broadvision, Inc. 333 Distel Circle Los Altos, CA 94022-1404 U.S.A. Tel: 415 943 3600 FAX: 415 943 3699	www.broadvision.com
Compaq Computer Corporation P. O. Box 692000 Houston, TX 77269-2000 U.S.A. Tel: 713 370 0670 FAX: 713 514 1740	www.compaq.com
Connect, Inc. 515 Ellis Street Mountain View, CA 94043-2242 U.S.A. Tel: 1 800 262 2638	www.connectinc.com

Exhibit B-1 (CONT.)

ICVERIFY, Inc. 473 Roland Way Oakland, CA 94621 U.S.A. Tel: 510 553 7500 Fax: 510 553 7553	www.icverify.com
Intuit, Inc. 2535 Garcia Avenue Mountain View, CA 94043 U.S.A. Tel: 415 944 6000 Fax: 415 944 6688	www.intuit.com
Mastercard International, Inc. 2000 Purchase Street Purchase, NY 10577-2509 U.S.A. Tel: 914 249 2000	www.mastercard.com
Microsoft Corporation One Microsoft Way Redmond, WA 98052-6399 U.S.A. Tel: 206 882 8080 Fax: 206 936 7329	Internet Explorer, Internet Information Server
Mondex International 47-53 Cannon Street London EC4M 5SQ England Tel: +44 (0) 171 557 500 Fax: +44 (0) 171 557 520	www.mondex.com
O'Reilly & Associates 103A Morris Street Sebastopol, CA 95472 U.S.A. Tel: +1 707 829 0515 Fax: +1 707 829 0104	URL: http://www.ora.com/ or WebSite http://website.ora.com
Netscape Communications 501 East Middlefield Road Mountain View, CA 94043 U.S.A. Tel: +1 415 254 1900 Fax: +1 415 528 4124	URL: http://www.netscape.com/
Oracle Corporation 500 Oracle Parkway Redwood Shores, CA 94065 U.S.A. Tel: 415 506 7000 Fax: 415 506 7200	www.oracle.com



Exhibit B-1 (CONT.)

Premenos Technology Corporation 1000 Burnett Avenue, 2 nd Floor Concord, CA 94520 U.S.A. Tel: 510-602/2000	www.premenos.com
Silicon Graphics, Inc. 2011 North Shoreline Blvd. Mountain View, CA 94043 U.S.A. Tel: 415 960 1980 FAX: 415 961 0595	www.sgi.com
Sony Corporation 3300 Zanker Road San Jose, CA 95134 U.S.A. Tel: 408/432-1600 Tel: 201-930-1000 (N.J.)	www.sony.com
Sun Microsystems, Inc. 2550 Garcia Avenue Mountain View, CA 94043-1100 U.S.A. Tel: 1 800 USA 4SUN	www.sun.com
Unisys Corporation P. O. Box 500 Blue Bell, PA 19424-0001 U.S.A. Tel: 215 986-5777 FAX: 215 986 6850	www.unisys.com
VeriFone, Inc. Three Lagoon Drive Redwood City, CA 94065-1561 U.S.A. Tel: 415 591 6500 FAX: 415 598 5504	www.verifone.com
Visa International P. O. Box 8999 San Francisco, CA 94128-8999 U.S.A. Tel: 415 432 3200	www.visa.com

Source: INPUT

Exhibit B-2 provides a short list of Internet standards committees and associations. There are many more.



Exhibit B-2

Internet Standards Committees and Associations

Association/Institute	Notes
World Wide Web Consortium (W3C)	An organization to develop common standards for the evolution of the Web, coordinated by MIT in the U.S. and INRIA in France.
Internet Engineering Task Force (IETF)	A consensus-building body that facilitates discussion and establishes new standards.
Internet Society	An international organization that aims to further cooperation and coordination for Internet technology and applications.

Source: INPUT

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INPUT Report Checklist

Report Code EEAG Report Program Electronic Commerce © Year 1997
Report Title Electronic Payment Methodologies
Author Angela Hey Date Submitted Covers Ordered
QC Wilson Haddow/Leslie Robbins Date Received _____ Returned _____
Editor Anna Reynolds Tribucco Date Received 1/13/97 Returned _____
Layout _____ Date Received _____ Returned _____
Prepub _____ Date Received _____ Returned _____

1. Editing (First Draft)

- ☒ Make note of precise report title for records
- ☐ Check:
 - ✧ TOC/LOE versus text heads/chart titles
 - ✧ headers/footers (title, INPUT, rule/code, © phrase, page #)
 - ✧ report pagination
- ☒ Edit entire report
 - ✧ text
 - ✧ headings
 - ✧ charts
 - ✧ CAGRs, etc.
- ☒ Mark queries for appropriate party:
 - author
 - layout person or prepub
 - INPUT policy arbiter
- ☐ Update style guide
- ☐ Enter changes on disk—be sure one current copy remains intact at INPUT for insurance!
 - ✧ mark anything not done CLEARLY so it will get done

2. Layout

- ☐ Make necessary layout changes
- ☐ Get queries answered
- ☐ Correct any visual problems (i.e., bad line breaks, widows)
- ☐ SpellCheck!

3. Prepub (BEFORE PRINTING)

- ☐ Proof report
 - ✧ changes all made correctly
 - ✧ no new mistakes
 - ✧ no visual problems
- ☐ Check pagination against TOC/LOE
- ☐ Make sure ALL queries have been satisfactorily settled
- ☐ Make sure ALL documentation is complete; with report/filed appropriately
 - ✧ "Blue Sheet"
 - ✧ this checklist

INPUT

Layout:
will need to check
all footers in ex. or.
re page numbers

EXECUTIVE OVERVIEW

Wilson's corrections
in black pen

Electronic Payment Methodologies

Anna
Wilson & I determined
that E-check
(e-check) will
be spelled:
E-Check ✓
(both E + C to be capped)
LR

Search for
purchasing card

erceive Program

To Our Clients:

This summary is an excerpt from a full research report, *Electronic Payment Methodologies*, issued as part of INPUT's Electronic Commerce Program. ~~A complete~~ *where* description of the program is provided at the end of this Executive Overview.

If you have questions or comments about this report, please call (415) 961-3300 to contact your INPUT analyst.

Abstract

? This report analyzes market trends for electronic payment methods. It provides insights into how payment processes will change as a result of the Internet as part of INPUT's Electronic Commerce Program. Representatives of 50 corporate users, 10 payment processing services, 8 bankers and 3 financial regulators were interviewed to capture data and commentary about the potential opportunities available in this market.

intel Electronic Payment Methodologies identifies the payment methodologies are that are most likely to become widely adopted. It also discusses trends, issues and future technology directions.

The report contains 124 pages and 53 exhibits.

check

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C.	Which Payment Systems Will Win?	6
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Executive Overview

A

Summary

Several credit card and micropayment schemes are being proposed for the Internet. The current preferred payment method for Internet transactions is to use a credit card. Visa, Mastercard, American Express, VeriFone, Microsoft and others are working on SET standards for credit card processing over the Internet and these are likely to be widely accepted.

Mondex, initiated by National Westminster Bank in the UK, is gaining global acceptance by banks and is a strong contender for a micropayment cash card scheme, both for storefront and network transactions. CyberCash, currently with a proprietary scheme, will follow SET standards and is likely to be a major technology supplier and payment systems vendor. Smaller companies like DigiCash may have to find niche markets, lest they be overtaken by Mondex and credit card vendors' cash card schemes. Visa and Mastercard will not allow the electronic cash systems vendors to encroach on their markets and will also be major players.

Digital signature schemes are starting to be accepted. Signatures stored in both wallets and on computers, slowly gathering momentum, will become common at the beginning of the next century. There will be tremendous opportunities for manufacturers of POS (point-of-sale) and payment processing systems to upgrade merchants, banks, and payment service companies. Security will become tighter as systems evolve and excellent opportunities in supporting, building and testing security systems will develop.

B

Key Trends and Issues

Exhibit 1 lists key trends and issues regarding electronic payments. Security challenges will increase as fraud and hacker activity grows. Digital signatures and encryption schemes will make Internet payment schemes safer than traditional checks that can be stolen, counterfeited, or signed with

forged signatures. Money laundering may be a long term issue.

(must have at least 2 lines together)

Exhibit 1

Trends, Issues and Opportunities

Trend	Issues	Opportunities
Security	- SET acceptance for credit card Internet transactions - Digital signatures will be gradually accepted - Certificate Authorities will be a new type of organization - Fraud will increase, although many Internet schemes are safer than current payment schemes	- Payment processors and banks can offer Internet services - Services and products based around security - Digital signature verification and authentication services - Fraud detection systems
Smart Cards	- Cost of merchant equipment - Consumer acceptance - Competition from debit cards, particularly in the U.S. - Card introduction in a new area - how to run pilot systems - For business-to-business trade, POs and checks are still preferred, although Purchasing Cards are increasingly used	- POS system upgrades - Global vendor systems to support worldwide purchasing - purchase here, deliver there - Internet credit card processing turnkey systems - Smart card "on the street" and "on the net" systems - Smart cards are likely to be used for small amounts
Robust Messaging	- More intelligent messages that include digital signatures - More reliable message routing - Multimedia messaging	- Services that rely on signed documents - Directory and routing services - Higher speed private networks - New businesses that sell small items and accept digital cash will become popular
Internet Shopping	- Will Internet malls succeed and who will run them - banks, Internet service providers, telecommunications companies or financial payment processors? - What payment methods will be preferred - a global digital currency could impact national economies	- Payment reporting and data aggregation will differentiate merchant services - Merchant services to support Internet shopping - Interfacing existing credit and debit card processing systems to the Internet - Check truncation systems, particularly scanning devices to capture check information

Bullet

Exhibit -0 (Continued)

Trends, Issues and Opportunities (Cont.)

Trend	Issues	Opportunities
Outsourcing data management	• New level of detail possible with Internet payments • Merchant services will increasingly be outsourced	• Customer analysis and reporting software • Long term outsourcing contracts • New applications that can be outsourced, for example transaction payment services using products like Open Market's OM-Transact

Source: INPUT

C**Which Payment Systems Will Win?****1. Outlook**

Credit cards clearly have an early lead for payment over the Internet, but for smaller transactions or anonymous purchases they are unsuitable.

Businesses continue to prefer checks to any other form of payment, although the use of Purchasing Cards is growing.

The Internet will fuel further growth of Purchasing Cards. Debit cards will increasingly be popular, but may have limited use overseas.

Cash cards are more widely used in Europe and Japan than in the U.S.. Vendors like Mondex that can combine Internet payment methods with those for storefronts are at an advantage over those that support either the Internet or storefronts.

Both checks and cash will see declining use over the next 10 years. However, neither is in danger of disappearing. Singapore, for example, aims for a cashless society, but for most countries this will be impractical.

Exhibit 1 lists the traditional payment systems reviewed in this report and summarizes their outlook.

Exhibit 11-2

Outlook for Traditional Payment Systems

Payment System	Outlook
Cash	• Will decline in use, particularly small denomination coins • Debit and credit cards will be the main alternatives • If cash declines significantly, central banks will be at risk of losing interest and therefore will want to be involved in issuing digital currencies long term - this will counteract technology providers' tendency to develop global currencies
Checks	• Check truncation with image scanning at point of capture will take advantage of existing systems • Paper checks will always be used for some transactions, but a decline in their use can be expected towards the end of the 20th century
EFT or ACH Transfers	• CheckFree, the Quicken Financial Network and other services that enable consumers and businesses to pay checks electronically will compete with Internet payment schemes
ATM Machines	• More global connections via Cirrus, Plus, Link and other networks • Mainly used by consumers, more intelligent ATMs that provide other services, like smart card replenishment, are being designed • May be adapted to supply other goods ^{e.g.} airline tickets, stamps
Credit, Debit and Cash Cards	• Mondex is a promising smart card scheme for both storefront and Internet purchases • Visa Cash and similar credit card company schemes will be likely to be successful
Trade Credit	• Will continue, because practices to support it are widely implemented

Source: INPUT

Exhibit 2 lists the major emerging payment systems reviewed in this report and summarizes their outlook.



Exhibit 2

Outlook for Emerging Payment Systems

Payment System	Outlook
CyberCash Cards and Coin	- CyberCash will move to SET standards as they evolve and is likely to be a major payment systems vendor. - Its coin scheme is subject to considerable competition and its future is less clear.
DigiCash E-Cash	- ECash is likely to be a niche product that is used by small businesses that cannot obtain credit card processing, although over time they are expected to have agreements with service bureaus and banks to undertake their payment processing. - It lacks the support of big business to be a serious threat to national currencies.
FSTC E-Check	- After a somewhat shaky start, the pilot was demonstrated in Sept. '96. A full pilot trial is expected by early 1997. - Skepticism surrounds E-check because it automates the paper process and seems cumbersome to credit card processors who have overcome many of the problems that the FSTC is trying to solve. - This is likely to merge with other schemes for digital payment as they are adopted and clear winners emerge.
First Virtual	- First Virtual has an innovative system that enables merchants to accept credit card payment even when they may not qualify to accept credit card payments. - This system supports largely small businesses. - First Virtual keeps its credit card numbers off the net for security, but this makes the processing more labor intensive than some of the other schemes. - As standards emerge, First Virtual may need to become a payment processor for other schemes, as it is unlikely that its processes will survive in the face of competition from Mondex, Visa and others.
Mondex and Visa Cash Cards	Mondex is a promising smart card scheme, initiated by National Westminster Bank in the UK, for both storefront and Internet purchases. Mondex has global partners and a strong awareness of the entire payment processing environment, including government regulations, that a smaller vendor cannot match.
SET Credit Card Processing	Widespread vendor support and popularity of credit card payment for Internet transactions make this a promising approach. For all except the smallest items it is likely to be the primary means of purchasing goods on the Internet.
SSL Netscape	- This is a simple standard for securing a web server, not a complete payment methodology. - It has been a quick fix for web merchants, but is likely to be integrated into more sophisticated systems that use SET.

Source: INPUT



Five-Year Outlook

1996 - Year of Internet Prototype Commerce

- SSL-enabled Commerce Web Servers for simple credit card encryption
- CyberCash and SET implementations start to be available
- Web use is mainly for promotion, with some order taking

1997 - Commerce Pilots Move To Significant Systems

- Web ordering takes off, many more commerce-enabled web servers
- Digital signatures start to be used and become a status symbol
- Wide availability of SET systems, software and services
- Internet wallet standard emerges
- New regulations for e-check and stored value cards
- E-check and check truncation FSTC projects continue
- Micropayment cards see success in new market niches
- Network computers for the Internet provide more low cost access, widening the potential market for goods sold over the Internet
- Explosion of Web Catalogs, especially for industrial products
- Digital certificates foster exchange of bills, invoices, ^{and} POs over the Internet
- Internet backbone gets upgraded to layered network offering different classes of service for different service fees, IPv6 increasing number of addressable nodes

1998/9 - Year of The Smart Card

- Micropayment schemes shake out, difficult times for vendors like CyberCash and DigiCash if they fail to adopt standards
- Visa, Mastercard, Europay roll-out microprocessor card "wallets"
- Signed e-checks complement the exchange of POs over the Internet, but acceptance rate is slow, given competition from Visa and others
- Internet bill presentment deployed

2000/1 - Market Maturity Begins

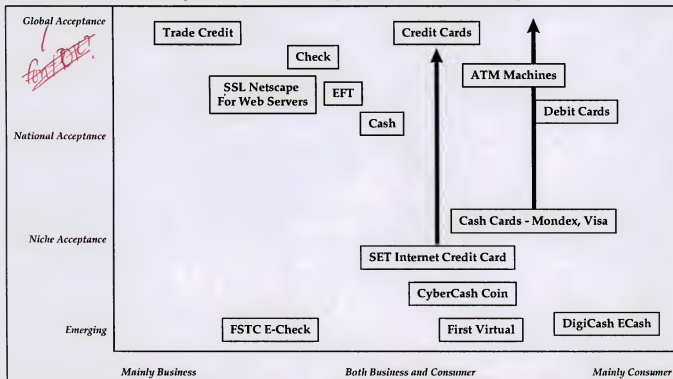
- Banks provide Internet business services
- Business accounting software incorporates modules for paying and billing over the Internet
- Value of goods and services traded over the Internet reaches \$165B in 2000 and \$600B in 2001

Payment Methodology Positioning

Exhibit 3 positions payment processing methods regarding acceptance and major users. Trade credit is the established method for business-to-business transactions, whether via purchase order (PO), bartering or letter of credit. Credit cards are accepted in most countries of the world, although the U.S. has more extensive use of them. Until recently when Purchasing Cards were issued they were primarily used by consumers and for Travel and Entertainment (T&E) in business. Increasingly they will be used by businesses for purchasing small items and for web transactions. The SET Internet payment scheme endorsed by Visa, Mastercard, Microsoft, VeriFone and others will be globally accepted as it rolls out in products and services, starting this year.

Exhibit -0

Payment Processing Method Positioning



Source: INPUT



D**Conclusions**

- Digital currencies are still in their infancy and no clear digital cash winner has yet emerged.
- Credit cards and the SET standards offer promise as an Internet payment method that is likely to succeed rapidly.
- Merchants are sensitive to costs. If a scheme has high costs, like credit card processing then it must offer additional benefits ^{such as} like superior reporting.
- Fast processing gives a methodology a competitive advantage, but bear in mind that merchants may want some time to pay bills. One way to address this is to waive transaction charges for certain classes of electronic transactions to encourage faster payment, just as POs offer advantageous terms for early payment.
- Excellent customer relationships will increasingly differentiate payment processors and service providers.
- Networking and Internet technology is sometimes hard to implement reliably. Systems must be set up that make it easy for customers to link to other systems.
- Use of widely accepted standards, such as SET, are essentials for any transaction processor.
- Transaction processing can be differentiated by bundling marketing data with an aggregate transaction report. Service providers need to understand how they can expand data capture and data aggregation processes to offer added value.

E**Recommendations****Recommendations for Merchants**

- Watch emerging smart card standards carefully; don't go it alone, ensure that other merchants in your market or region are using the same technology.
- Invest in multi-purpose equipment.



- Offer your goods and services on the web.
- Consider using a service provider, bank, or payment processor to handle Internet web commerce functions.

2. Recommendations for Non-storefront Businesses

- Evaluate where Purchasing Cards can best be used.
- Consider using the Internet for purchasing, if this is not already used.
- Offer employees guidelines for paying for goods and services purchased from web servers.
- Consider the level of data aggregation and marketing information required when choosing new payment schemes.

3. Recommendations for Banks

- Consider offering a pilot Smart Card project in an entire town to establish merchant relationships.
- Offer web merchant services and support, either directly or via third parties, to merchants with which you have credit card or banking relationships.
- Explore check processing and consider how back-end systems can be made to handle Internet payment systems. retrofitting old systems may not be the easiest migration; it may be easier to consider alternative processes.
- Team up with recognized Certificate Authorities and promote the use of digital signatures for other businesses, such as loans.
- Offer services that help merchants and businesses pay consumers electronically.

4. Recommendations for Payment Product and Services Vendors

- Offer Internet services to existing customers, or risk losing their entire payment processing business to a competitor who can provide Internet services.
- Consider how financial check paying networks will interface with Internet payment systems.



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